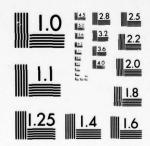


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RADC-TR-76-329, Volume VII (of eight) Final Technical Report December 1976



SOFTWARE DATA COLLECTION STUDY Compendium of Procedures and Parameters

System Development Corporation

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GRIFFISS AIR FORCE BASE, NEW YORK 13441

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This report has been reviewed and is approved for publication.

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COMPENDIUM OF PROCEDURES AND PARAMETERS

1. INTRODUCTION

This Compendium supplements and extends Volume 003 of this report. Before attempting to use this Compendium, Volume 003 should be read and consulted to resolve any questions that arise.

1.1 PURPOSE

This Compendium sets forth (a) data collection forms sufficient to collect data for project summary, progress and error reports; (b) a data base structure with record contents and access path schematics; and (c) definitions of the data parameters used in the data collection forms and procedures. These parameters include those required to support productivity, reliability and cost analyses and evaluate the effectiveness of project and configuration control procedures as well as other factors associated with project efficiency and product quality.

Data necessary to support productivity analyses include those environmental parameters that impact the performance of project personnel, plus the measures of work performed and resources consumed that establish productivity. In addition, both original estimates and actual resulting values of the parameters are recommended for collection, yielding potentially valuable information pertaining to estimating and the estimating and performance process.

Data necessary to support reliability analyses include such environmental parameters as product characteristics and production methodology, and such performance data as product quality requirements and structural and functional deficiencies in the final products. Such deficiencies may be detected by product reviews and audits, by the application of formal tests, or by failure during operation. Any request for modification to the product whether due to environmental changes, analytic oversights or product fault are classed as problems for the purposes of program quality evaluations.

Cost studies are supported by data reflecting the methodology used to estimate, define, plan and allocate the total work package, considering the unique project factors impacting the allocation and expenditure of available resources.

The justification for the selection of data parameters and their use in analysis of productivity, reliability and costs are fully presented in Volume 003 of this report.

1.2 CONSTRUCTION OF DATA COLLECTION FORMS

The parameters defined in Section 4, Data Parameter Descriptions, are not nearly all the data items that could be collected but are a distillation of the potential items reviewed in Volume 003. Nevertheless, these parameters do represent a large volume of data, some of more importance or more promising to research results than others. Since it is desirable to approach the complete software data repository gradually and to undertake a trial period with a pilot facility before committing to a final decision and design, three incremental sets of parameters have been defined. These sets were established by:

- a. Examination of past and present data collection studies.
- Examination of current data collection monitors, including automatic and manual systems.
- c. Establishment of data acquisition priorities by RADC to support its current research.
- d. Distillation of these factors in view of data availability and data collection problems.

The data collection forms were designed in three groups. Group 1 contains the high priority items. Group 2 contains these items, plus the addition of second priority items. Group 3 additionally contains third priority items. Further, since "like" data parameters in Group 3 differ somewhat in scope of possible alternatives and purpose in collection than those in Group 1, slight differences in definition of the variables exist.

In use, Group 1 items are those believed minimally useful for the study of productivity and reliability. Group 2 contains many environmental factors that might impact productivity and/or reliability and that should be added selectively to the data collection effort as the need arises, or dropped if the parameter proves not to be associated with productivity or product quality. Group 3 items represent an expansion in scope as well as additional parameters and should be added only for special studies or a full-blown system. Each set represents a considerable expansion and consequent cost in data collection and storage so that the benefits to be derived from the measurement should be weighed against the cost of acquisition.

In designing the proposed data collection forms and procedures, an overall concept of modularity was adopted. Each form is aimed at collecting data at a particular source and time period and at creating or maintaining a single entry in the software data base. The principle advantages of modularity beyond the degree of correspondence with data acquisition conditions are its minimization of the effects of obsolescence and its flexibility in adapting to a variety of conditions.

First, a modular data collection systems is adaptable to the demands of a diversity of projects and project conditions. Only those forms need be used that collect data pertinent to a particular project. Second, as the emphasis on specific research areas shifts within RADC, data parameters will change and new forms may be easily added and old forms deleted to a modular set. Third, if data parameters on a particular form must be redefined or must change, simple, modular forms are easier to update than complex ones. Modularity reduces the number of changes made on any one form and limits the confusion and costs arising from frequently changing forms and procedures. Fourth, since the data collection effort is to be initiated on a limited basis, a flexible set of forms collecting the minimum number of parameters to support performance and reliability studies is sufficient to meet the requirements of the pilot facility. At the same time, the collection system is expandable to cover the future demands of a more extensive facility. Fifth, a modular set of forms is more likely to be adaptable to improvements to the system that arise as the data collection procedures are evaluated.

It must be assumed that the data entry and data management system and the data base are similarly modularly constructed and maintainable. As new software tools are developed and installed at the central facility or project sites, commensurate alterations in data collection, data entry, and data management systems will be necessary. The flexibility provided by modularity is needed in all aspects of the system.

Figure 1-1, Data Collection Forms, lists the forms that have been designed and briefly states the purpose of each.

1.3 COLLECTION FREQUENCY

Software system development is a dynamic process. If we are to understand that process and control its behavior, the process must be sampled periodically. To control, actual performance must be compared with that expected and, if a difference (i.e., a 'variance') exists, either performance or expectations must be adjusted. At a minimum, then, all parameters (except identifiers) need to be collected twice, first as estimated or planned values, and second as actual, real or experienced values obtained after the work has been performed or as accumulated during a reporting period. For data that are accumulated as the project progresses, such as for schedule performance, products produced and resources expended, it is strongly recommended that the reporting period (and sampling frequency) not exceed one calendar month. Each data collection form specifies the recommended time for completion and submission to the repository and whether the data represents estimated or an actual value. Note that in the data base the successive samples form repeating groups of data parameters.

Because of the high costs of data collection, both the data set and the reporting frequency should be established by contractual and financial conditions. RADC must determine what data are required to support studies above the minimal set required to evaluate performance and control the project. While this study has made recommendations concerning priorities and frequency of collection, it may be necessary to alter these optimum frequencies due to contractual and financial considerations or research demands.

P1	Project Environment Information Form	Defines project, obtains size and complexity estimates.
P2	Contract/Customer Information Form	Obtains information on customer/contract conditions.
Р3	Software Installation Form	Obtains information pertaining to software installation in the situation where operational site differs from development site
P4	Subcontractor Infor- mation Form	Obtains information on subcontractor(s) responsibilities and interactions.
P5	Organization Infor- mation Form	Defines the organization of project personnel
P6	Employee Information Form	Obtains employee(s) experience information.
P7	Computer Equipment Information	Defines the computer configuration(s) used in software development.
P8	Computer Support Facility Information	Obtains information on the quality of the support facilities used by project.
P9	Programming Techniques Information	Identifies concepts, methodologies and tools used by project in development process.
P10	Programming Language Information Form	Defines programming languages used by project personnel.
P11	Program Production Library Information Form	Obtains information on PPL costs and effectivity.
roje	ect Performance Collection	Forms
W1	Work Definition Information Form	Defines the work breakdown structure used by project.
W2	Product Identification Form	Defines the products in the total work package.
W3	Project Performance Information Form	Obtains work progress and resources expended data, for the current reporting period.
W4	Software Problem Report	Identifies all changes, errors, descrepancies etc., found to exist in any product.
W5	Software Modification Transmittal	Identifies all changes, modifications, etc., made to the product.

Figure 1-1. Data Collection Forms

Figure 1-1. Data Collection Forms (cont'd)

1.4 MANUAL AND AUTOMATIC COLLECTION CONSIDERATIONS

The structure of the proposed data base consists of project environment data, project performance data and product quality measurements. Project environment data are normally generated with estimated and actual values and are best collected by manual methods. Project performance data are generated and updated with values for each reporting cycle. Being summary in nature, these data could be acquired more frequently than the repository's reporting period and stored in a project monitor system with automatically generated data for semi-automatic reporting. The proposed data collection forms will be used with either manual or semi-automatic accounting systems. Product quality measures are generated automatically each time an analysis program is used and are best collected in a summary form automatically. All classes of data will exist as multiple record types and will be interrelated by hierarchical subsets of repeating elements and/or linkages.

Manual data collection forms have been designed for both project environment and project performance data, but not for product quality measurements or other measures that should only be collected automatically. For the most part, automatically collected data relate to the structural and behavioral characteristics of the software product and are obtained by static and dynamic evaluations and tests applied to the product. In some cases, this information could be manually submitted or at least summarized, but the time and expense required to collect and submit data of such huge volume would be exorbitant. Even computer storage of such a large volume of data would be expensive and unjustified except in special cases. As an alternative, automatically collected data can be stored as hard copy or on magnetic tape in the research library. In this case, a method or mechanism for pointing to specific contents of library listings or tape files should be designed and added to the data base. A method to summarize automatically collected data and to store it in the data base should be developed. A partial list of automatically generated data parameters are listed in Section 4. Their exact definition and interrelationships are not included since this information depends upon the purpose, availability, and structure of the automated tools.

An example of the forms involved in the collection of project specific product definition data, the D1 Computer Operations Identification Form, which identifies computer operation and completion codes, is included in the data collection forms and procedures. Product quality definition data necessary to support RADC research includes identification of compiler errors, language constructs, variable specifications, o/s errors, etc. The huge volume of definition data needed in conjunction with the use of automated software production tools almost negates its storage in a computer data base, and serious consideration should be given to its storage in a document library. The economic feasibility of using computer storage versus document storage rests upon the evaluation of such unknown factors as the number and types of data accesses, number of users, volume of textual information, maintenance requirements, and demand for currency. A high index on any of these parameters might dictate data base storage, but the initial conclusion of the study is that document library storage should prove satisfactory.

DATA COLLECTION FORMS AND INSTRUCTIONS.

Several factors have been taken into consideration in the process of designing the data collection forms. For the most part, these factors are concerned with the editing and standardization of the input data. It should be noted that all record structure, record linkage and division of data to specific record types has been derived after examination of the input data and editing considerations only. The updating and retrieval of the data has not been thoroughly examined in regards to the proposed data base structure. It is recommended that these two areas be studied thoroughly to determine their impact, if any, on the proposed data collection system, including the collection forms, data base structure, and input conventions.

Since free form comments are extremely difficult to tabulate, an attempt has been made to store a minimum amount of textual information in the data base. For the same reason a rating scale of 1 to 10 is used to standarize all subjective evaluations, although a standard scale with a wider or more limited range is certainly possible and perhaps desirable. Multiple choices are given when possible, and further investigation as to the extent of the possible choices should be made before system implementation.

In the event that standard choices are not imposed on the user, synonym conversion may be used for the purpose of standardization. For example, it may be desirable to allow the user to enter with "W", "WK," or "WEEKLY", but regardless of the input, a "W" would be stored in the data base. Synonym conversion can be either a manual or automatic process; in either case it is accomplished by table-lookup. (Although this alternative exists, it is not the recommended procedure for the data collection system. It is felt that establishing a set of user requirements early in the data collection process will simplify both the manual and automatic processing requirements.)

Another area where standardization must be considered is the definition of terms used by the data collection system and data repository. It is well known that common are widely misunderstood, misused, or have multiple definitions within the software industry. While it should not be the goal

of the RADC repository to standardize terms, it is necessary to define the terms used in the data collection system. This is particularly applicable to the area of programming techniques. In order to compare techniques across projects, it is necessary to identify the technique by title and define its exact meaning. Obviously, this is no small task. However, if comparable data is to be collected over a wide range of products, it must be done. The data collection system has made provision for the submission of such definitions, such as the definition of skill levels for employees, Attachment 1 - Skill Level Classification, associated with P6 Employee Identification Form, and Attachment 2 - Error Categorization, associated with W5-3 Software Modification Transmittal These attachments are offered as a sample supporting the concept of modular expansion or redefinition as the requirements of the repository alter.

The data collection forms for each of the three groups follows. Each form is presented with both the instructions for completion and submission and a description of each parameter included on the form. This description also includes the definition of the parameter, and the suggested format and length of the data parameter, i.e., F-8, fixed length, eight characters; V-256, variable length, 256 characters; F-3.1, fixed length, three numeric characters and one decimal position. An additional column (E/A) marked by an X indicates that the entry has both an estimated and actual value.

2.1 DATA COLLECTION FORMS - GROUP 1

The following data collection forms comprise Group 1 for collecting the minimum set of data considered necessary to support productivity, reliability, cost, and language studies for the RADC repository. Group 1 consists of the following forms:

- Pl Project Environment
- P6 Employee Information
- P7 Computer Equipment
- P9 Program Techniques
- P10 Programming Language
- W1 Work Definition
- W2 Product Identification
- W3 Project Performance
- W4 Software Problem Report
- W5 Software Modification Transmittal
- W6 Software Operations Log
- D1 Computer Operations

Attachment 1 - Skill Level Classification

P1-1 PROJECT ENVIRONMENT INFORMATION FORM

DATE OF SUBMITTAL: 1 TITLE: 3 DESCRIPTION: 4	PROJECT IDENTIFIER: ②
START DATE: (5)	END DATE:(6)
CONTROL AUTHORITY: (7)	NUMBER OF CONTRACTORS: 8
PROJECT SIZE ESTIMATES	Ph Pluggan Techniques
Total Manpower: (9)	
Total Pages Documentation: 10	northway and Area TV
Total Number Program Modules: (11	
Total Number Subsystems: (12)	us fraction Partor June
Total Number Source Statements in	Operational Software: (13)
Total Number Source Statements in	
Total Number Object Statements in	
Total Number Object Statements in	Support Software: (16)
Total Number Bytes in Data Base:	①
PROJECT COMPLEXITY ESTIMATES	
Overall Project: (18)	Application Software: (19)
Control/Operating System: (20)	Support System/Tools/Aids: (21)
Data Base Structure: (22)	
PROJECT EVALUATION RATINGS	
Quality of Requirements Specifica	tions: (23)
Quality of Design Specifications:	0
Schedule Adequacy: (25)	
Overall Project Management Effect	iveness: 26
Overall Project Personnel Qualifi	cations: (27)
Computer Resources Adequacy: (28)_	
Quality of Customer Supplied Info	rmation: 29
Timeliness of Review Actions: (30	
Funding Adequacy: (31)	
PROJECT SOFTWARE TYPE: 32 BUSINE	SS SCIENTIFIC SYSTEMS
MAINTE	NANCE OTHER

P1-1 PROJECT ATTRIBUTES INFORMATION FORM

To be completed and submitted at initiation and completion of the software development project. This form defines the reporting project, the project size, software complexity, and adequacy of other project specific parameters.

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Title	3	F-16		A short name or descriptive title for the project.
Description	4	V-256		A brief narrative description of the software development project, covering its objectives, scope and approach.
Start Date	(5)	F-6		Date project is initiated.
End Date	6	F-6	X	Date project is to terminate.
Control Authority	(5) (6) (7)	F-10		The name or phrase characterizing the customer's configuration control agency, e.g., SPO, CCB, project monitor, etc.
Number of Sub- contractors	8	F-4	Х	Total number of subcontractors partici- pating in software development project.
Total Manpower	9	F-8	X	The number of man years required for the software project.
Total Pages of Documentation	0	F-8	X	The total number pages of documentation to be produced during the performance of the project.
Total Number Program Modules	0	F-8	X	The total number of modules to be produced during the performance of the project.
Total Number Subsystems	13	F-8	X	The total number of subsystems to be produced during the performance of the project.
Total Number Operational Source State- ments	(3)	F-8	X	The number of deliverable POL state- ments in the operational system.

P1-1 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Total Number Support Source Statements	14)	F-8	X	The number of deliverable POL statements in the support software.
Total Number Operational Object Instruc- tions	15)	F-8	X	The number of deliverable MOL state- ments in the operational system.
Total Number Support Object Instructions	(16)	F-8	X	The number deliverable MOL statements in the support software.
Total Number Bytes in Data Base	17	F-8	X	The number of bytes of storage required for data storage.
Overall Project Complexity	18	F-2	X	An evaluation of the degree of complexity of the project, independent from the complexity of the software produced. (This evaluation should consider such factors as the number of coordination points, number of subcontractors, number of agencies per product, number of internal coordination points, number disciplines involved, number and variety of products produced, number and variety of information sources.) Rating scale is 1-10, where 1 = easy, 10 = most difficult.
Application Software Complexity	19	F-2	X	A complexity rating for the known characteristics of the solution algorithm software being developed. Rating scale is 1-10, where 1 = easy, 10 = most difficult.
Control/Operating System Complexity	20	F-2	X	A complexity rating of the control software or operating system, either being developed or used by the software development project. Rating scale is 1-10, where 1 = easy, 10 = most difficult.
Support System/ Tools/ Aids Complexity	2)	F-2	x	A rating of the complexity in the use, interactions and/or documentation of the support software. Rating scale is 1-10, where 1 = easy, 10 = most difficulty.

P1-1 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Data Base Structure Complexity	22	F-2	X	A rating of the complexity of the data base, size and structure. Rating scale is 1-10, where 1 = easy, 1 = most difficult.
Quality of Requirement Specifications	23	F-2		An evaluation of the clarity, compleness, implementability and verifiability of the project requirement specifications. Rating scale is 1-10, where 1 = very high quality, 10 = poor quality.
Quality of Design Specifications	24)	F-2	X	An evaluation of the design specifications for their completeness, clarity, and detail. Rating scale is 1-10, where 1 = high quality; 1= poor quality
Schedule Adequacy	(25)	F-2	X	An evaluation of the tightness of project scheduling in view of the total project. Rating scale is 1-10, where 1 = adequate, 10 = inadequate.
Overall Project Management Effectiveness	26)	F-2	Х	An evaluation of the management control of the project based on the stringency of administrative plans, configuration control procedures, technical direction given, etc. Rating scale is 1-10, where 1 = effective management, 10 = ineffective management.
Overall Project Personnel Qualifications	27	F-2	X	An evaluation of the project personnel including management, technical and administrative support people, in meeting the projects performance goals. Rating scale is 1-10, where 1 = highly qualified, 10 = poorly qualified.
Computer Resources Adequacy	(8)	F-2	X	An evaluation of the computer resources and services to meet the requirements of the project. Rating scale is 1-10, where 1 = most adequate, 10 = highly inadequate.
Customer Supplied Information	29	F-2	X	An evaluation of the customer supplied data and/or equipment based on the completeness, timeliness and accuracy (freedom from errors and deficiencies) Rating scale is 1-10, where 1 = high quality, 10 = poor quality.

P1-1 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Timeliness of Review Actions	(8)	F-2	X	An evaluation of the length of time it takes to process an item through the review and approval cycle, especially in terms of exceeding scheduled review periods and priority, importance or immediacy of the need for a decision. Rating scale is 1-10, where 1 = most expedient, 10 = most time consuming.
Funding Adequacy	3)	F-2	X	An evaluation of the adequacy of project funds to meet the software deliverable end items. Rating scale is 1-10, where 1 = adequate, 10 = most inadequate.
	32	F-12		Indicate the gross classification of programming. Choices include: BUSINESS SCIENTIFIC SYSTEMS MAINTENANCE OTHER
Turns has cabation open title by two roles a whole of children	5 823 19 909 19 948 109 905	SJBICH SOLOGY D SPINS VICES		

P6-1 EMPLOYEE INFORMATION FORM

DATE OF SUBMITTAL: EMPLOYEE IDENTIFIER: SKILL LEVEL:(4)1 2 3 4	ROJECT ID		sar nerthe market
JOB TITLE: 5 ORGANIZATION IDENTIFIER(S): 6	2[_] 0[
YEARS EXPERIENCE In Data Processing:	8	\$ (i)	Satu of Substitut
EDUCATION:LEVEL:① HS YRS COLLE WORK IDENTIFIER(S): ①			TITUE SEVELUES INCOMES THE TITUE OF THE SECOND SECO
	<i>!</i> .		

P6-1 EMPLOYEE INFORMATION FORM

To be completed and submitted for each employee when assigned to an organization within the project. This form provides information on employee past experience and current work assignments.

Parameter	Key	Format	E/A	Description
Date of Submittal	①	F-6		Current date, either project initia- tion or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Employee Identifier	(3)	F-8		A name or number uniquely identifying the project member.
Employee Skill Level	4	F-2		A short name or number designating the level of advancement or skill of the personnel. (See Attachment 1 for Skill Level Classification.)
Employee Job Title	(5)	F-20		A short descriptive phase identifying the position filled by the employee in the organization, e.g., Section Head, Chief Programmer, PPL Librarian, etc.
Organization Identifier	6	F-8	Х	A short acronym or number that uniquely identifies the organizational element(s) to which this employee is assigned. (Each Identifier included must have a P5 Form associated with it).
Years Experience in Data Processing	1	F-3.1		The total number of years the employee has been engaged in the data processing field.
Years Experience with Project Programming Language	(8)	F-3.1		The total number of years experience employee has had with the programming language being used by the project.
Years Experience in Application Area	9	F-3.1		The total number of years experience the employee has had with the specific data processing application.

P6-1 EMPLOYEE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Years Experience in Management	10	F-3.1		The total number of years experience the employee has had in a position of management or equivalent responsibility.
Years Experience with Target Computer	①	F-3.1		The total number of years experience the employee has had with the object computer.
Education Level	12	F-3.1	78°	The number of years of high school and college the employee has acquired (30 semester hours = 1 year).
Personnel's Work Identifier(s)	13	F-8	X	A name or number uniquely identifying the work element(s) to which the individual is assigned. (Each identifier included must have a Wl Form associated with it).
T testimon				(8) 1883 1 1885 1 133084
		5		

P7-1 COMPUTER EQUIPMENT INFORMATION FORM

DATE OF SUBMITTAL:	PROJECT IDENTIFIER: (2)
DEVICE IDENTIFIER: 3	to literappent
DEVICE DESCRIPTION STATISTICS:	
Memory Size: 4	Unit of Measure: (5)
Number CPU's: 6	Number I/O Channels:
Memory Cycle Time: 8	ple di calcidatione di caracteria di
Unit of Time Measure: Nano	Micro Sec
DEVICE TYPE: 10 Mini Micro SECONDARY STORAGE STATISTICS: Number Tape Drives: 11 Number Random Access Devices: 12	Midi Maxi Special Purpose [
MAJOR INPUT DEVICE TYPE: (13) Card PRODUCT IDENTIFIERS: (14)	Li vapor rapo Li reniminar Li

P7-1 COMPUTER EQUIPMENT INFORMATION FORM

To be completed and submitted at project initiation for <u>each</u> computer configuration used by the project for software development. This form identifies the computer equipment capabilities.

Parameter	Key	Format E	/A Description
Date of Submittal	0	F-6	Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.
Memory Size	4	F-10	The amount of information the computer memory can store and base, e.g., 64K.
Unit of Measure	(5)	F-10	The unit by which the storage capacity is measured, e.g., bit, byte, word.
Number of CPU's	6	F-4	The total number of central processing units associated with the identified computer.
Number of I/O Channels	7	F-4	The number of hardware devices that connects the CPU and main storage with the I/O control units.
Memory Cycle Time	8	F-8	CPU cycle or access time.
Unit of Measure	9	F-5	The unit by which cycle time is measured, e.g., nanoseconds, microseconds, seconds.
Device Type	10	F-7	The general classification of the computer equipment according to size.
			Mini - A computer with a portable
			mainframe. Micro - A computer that is micro- programmable and is also portable.
			Midi - A medium size computer, e.g., PDP10, IBM 360/20-370/158.
			Maxi - A large scale computer capable of multiprocessing, e.g., CDC 7600, IBM 370/191.

P7-1 COMPUTER EQUIPMENT INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Device Type (cont)				Special- Computer built to specific specifications for a particular application.
Number Sequential Access Devices	11)	F-6		Number of devices providing secondary storage of sequential access type, e.g., tape drives.
Number Random Access Devices	12)	F-6		Number of devices providing secondary storage of random access type, e.g., discs, drums.
Major Input Device Type	(3)	F-10	10	Type of input device that provides the major percentage of input data Choices include: Card - Punched cards Paper tape - Punched tape Terminal - Remote site input
Product Identifiers	(4)	F-8		Identifiers of product elements using this hardware device. This field may be left blank when a single computer device is used for the development of all products. In the event that more than one device is identified for software development, specify the highest level Product Identifier using the device, e.g., the subsystem name.
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			167	

P9-1 PROGRAMMING TECHNIQUES INFORMATION FORM

DATE OF SUBMI	DATE OF SUBMITTAL:			PROJECT IDENTIFIER:		
TECHNIQUE IDENTIFIER(S)	TECHNIQUE CLASS(ES)	TYPE C A M O	CO: ACQUIRE	ST OPERATE	TRAINING EFFORT	INDEP. RATING
3	4	(5)	6	①	8	9
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101 201 201 201 201 201 201 201 201 201		· .				

P9-1 PROGRAM METHODOLOGY INFORMATION FORM

To be completed and submitted at completion of the work definition phase and at completion of the software development project. This form provides information on the programming techniques that are both planned and actually used during the development process. All techniques, tools, concepts, etc., used by the project should be identified.

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either the completion of work definition or completion of the project, in the format yymmdd.
Project Identifier	(2)	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Technique Identifier	(3)	F-20	Х	A short descriptive title of the technique.
Technique Class(es)	4	F-24	X	Identification by class of the techniques used by project personnel in the process of developing the software. (Some techniques may belong to more than one class. In such cases, identify all classes) Classes include:
				Analysis - The class of techniques used in the analysis phase of software development. Example techniques of this class include modeling, simulation trade-off studies.
				Design - The class of techniques used in the design phase of software development. Example techniques of this class include top-down, modeling, proofs of correctness, informal design, bottom-up, hierarchical structure, modularity.
				Implementation - The class of techniques used in the implementation phase of software development. Example techniques of this class include modularity, restricting control flow, programming standards, bottom-up, proofs of correctness, program production library.

Parameter	Key	Format	E/A	Description
Technique Class(es) (cont'd)	NO N	semitie actification (oos smile) if a labor		Management - The class of techniques used in managing the software project directly supporting program production Example techniques of this class include chief programmer teams, configuration management, program production library, build approach.
language, aprince straint. Reting era i = independent	Legyes op vent de Jaj Lege	pheres ero ja 22. gl 8066 r		Quality Assurance - The class of techniques used by the project to assure software quality. Example techniques of this class include static test tools, dynamic test tools, test teams, top-down testing, bottom-up testing, program production libraries, formal design walk thru.
				Notational Mechanisms - The class of mechanisms used in documenting the software and/or previously mentioned developmental techniques. Example techniques of this class include HIPO, programmer's notebook, decision tables, flowcharts.
Technique Type	(5)	F-2	X	An indication of the degree of mechan- ism involved in the application of the technique to the work or product. Choices include:
				Conceptual - Application of an idea to the development process.
				Manual - An established procedure, unaided by automatic means.
				Automatic - A computerized approach to aiding in the solution to the problem.
				mi <u>X</u> ed - Any of the above in combin- ation.
Acquisition Cost	<u>6</u>	F-8	Х	The cost in dollar resources of acquiring or developing the technique or tool, if applicable.
Operation Cost	1	F-8	X	The cost, in dollar resources, involved in using the technique.

P9-1 PROGRAMMING METHODOLOGY INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Training Effort	8	F-4	X	An estimation of the average degree of educational effort required to become proficient in the use of the technique or tool, in man days effort.
Independence Rating	9	F-2	X	The degree to which this technique stands alone; that is, can be used independently of a particular machine, operating system, language, application, or other constraint. Rating scale is 1-10, where l = independent, 10 = dependent.
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P10-1 PROGRAMMING LANGUAGE INFORMATION

ATE OF SUBMITTAL (1)	PROJECT IDENTIFIER: (2)	
OURCE/OBJECT LANGUAGE IDENTIFIER:	3	
Language Acquisition costs.	<u>4)</u> <u>5</u>	
ROGRAMMING LANGUAGE EVALUATION RAT Compiler/Assembler Reliability: Language Documentation: Language Efficiency: Language Relevance to Project Goa	6 7 8	
Test Control Monitor Debugg Test Data Generator Test D Macro Preprocessor Reform		ounes.d

P10-1 PROGRAMMING LANGUAGE INFORMATION FORM

To be completed at project initiation and completion for each programming language used by project personnel. This form provides information on resources expended and capabilities provided in the use of the specific programming language.

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either project initiation or completion in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Source/Object Language Identi- fier	3	F-12		Name or designator of the source or object language used, and for which all remaining parameters are associated.
Language Acqui- sition Costs	4	F-8	X	The total resources expended in dollars for the acquisition and/or installation of the programming language, if applicable.
Language Training Costs	(5)	F-8	X	The total resources expended in dollars for the training of project personnel in the use of the programming language, if applicable.
Compiler/Assembler Reliability	6	F-2	X	An evaluation of the degree of reliability in the use and operation of the language compiler and/or assembler. Rating scale is 1-10, where l = very reliable, l0 = unreliable.
Language Documentation	7	F-2	X	An evaluation of the accessability and understandability of the documentation supporting the specified programming language. Rating scale is 1-10, where 1 = good, 10 = poor.
Language Efficiency	8	F-2	X	An evaluation of the operational efficiency of the language within the operating milieu of the hardware/ software support systems. Rating scale is 1-10, where 1 = efficient, 10 = inefficient.

P10-1 PROGRAMMING LANGUAGE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Language Relevance to Project Goals	9	F-2	X	An evaluation of the programming language in its support of project specific goal, such as programming standards and/or structured programming. Rating scale is 1-10, where 1 = high, 10 = low.
Language Support Tools	10	F-24	X	Check the tools or capabilities associated with the language and/or compiler. Choices include:
			at V	Program Interface Consistency Analyzer Cross Reference Analyzer Program Instrumenter Test Control Monitor Debugging Interpreter Test Data Generator Test Data Reducer Macro Preprocessor Reformatter Standards Auditor Structured Programming Auditor
				25-11-1-11-11-11-11-11-11-11-11-11-11-11-

WI-1 WORK DEFINITION INFORMATION IN THE TAMEBURE STATE OF THE PROPERTY OF THE

WORK LEVEL: (3) Prowork IDENTIFIER: WORK DESCRIPTION: IDENTIFIERS OF RE	PORTING WORK ELEMEN	Task [] Act ITS: 6	ivíty []
	RESOURCE UTILIZA	ATION DATA	
RESOURCE ID	UNIT	ALLOCATED	EXPENDED
10		(12)	(3)
PRODUCT IDENTIFIE	rs: <u>(14)</u>		

W1-1 WORK DEFINITION INFORMATION FORM

The Work Definition Information Form provides data on the work breakdown structure in an hierarchical manner, showing the relationship of all work elements and the chain of authority for each work element the software development project has defined. The form is to be completed and submitted at project initiation, work plan formation, or when the work package allocation is changed. A Work Definition Information Form is to be completed for each element for which resource allocation is made.

Parameter	Key	Format	Description
Date of Submittal	•①	F-6	Current date, either project initiation, work plan formation or change in work plan definition, in the format yymmdd.
Project Identifier	2)	F-8	An acronym, number of other identifier that uniquely specifies the project, and identifies all data collection forms.
Work Level	3	F-8	Indication of the work breakdown level. Choices are project, phase, task, activity.
Work Identifier	4	F-8	A name or number uniquely identifying this particular work element, and for which manpower, computer, etc., resources will be allocated.
Work Description	(5)	V-256	A brief narrative description of the work to be performed including the purpose, scope and method for this element.
Identifiers of Reporting Work Elements	6	F-8	Identification of all of the elements into which this work element is subdivided.
Initiation Date	(1)	F-6	The calendar date for starting the work element, in the form yymmdd.
Completion Date	(8)	F-6	The calendar date for completing the work element, in the form yymmdd.
Terminator	9	F-12	The action taken that completes the work element being defined. This may be a milestone, an informal review, or a delivery.

W1-1 WORK DEFINITION INFORMATION FORM (cont'd)

Parameter	Key	Format	Description
Resource Identifier	(e)	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type travel type, computer time, storage, etc.
Resource Unit	(1)	F-10	The basic unit of expenditure of the resource, as manhours, mandays, hours, minutes, etc.
Resource Allocated	(12)	F-8	The total amount of the resource unit allocated or budgeted for the total work element.
Resource Expended	(13)	F-8	The amount of allocated resource expended to the reporting date for this
ra Linguis Anna Al Millian (Al	11		work element. (Generally, this field is blank since the form is submitted at initiation of the work element, prior to resource expenditures. However,
			in the event that resources have been expended, include all expenditures for this work element to date.) Calculated from monthly status reports after initial input.
Product Identifier(s)			The unique identifier of the specific product, or service, whose production is evaluated. (The combination of characters uniquely identifying the work element and associated products together form the key by which all products within all work elements
now and the Profession Subscript the		de versel Price calver Alderte	can be identified. Resource expenditures and productivity data are periodically collected via these
		work of the	identifiers.) All products identified must be described on the W2 Product Identification Form.
rs completes the castrage. This way castral review.	64 d 1		Termination

W2-1 PRODUCT IDENTIFICATION FORM

DATE OF SUBMITTAL:	PROJECT	IDENTIFIER	1:(2)	mr T
PRODUCT IDENTIFER: (3)	MOD: (4)_			315.0
PRODUCT TYPE: 6 Document P		Data 🗌	Test 🗌	fle
REPORTING LEVEL: 7 System 7 PRODUCT DESCRIPTION: 8	Subsystem		lule []	5063
IDENTIFIERS OF PRODUCT COMPONENTS	: 9			
PRODUCTION DATA RELATED TO PRODUC				
Work Unit: (10) Size: (PROGRAMMING LANGUAGE IDENTIFIER:		COST: (1	2)	6019J 1864
PRODUCT COMPLEXITY: (14)				
PROGRAMMING TECHNIQUE IDENTIFIERS	USED: (15)			
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W2-1 PRODUCT IDENTIFICATION FORM

To be completed and submitted at completion of the work or product definition phase and at completion of the software development project for each product being developed. This form provides information identifying each configuration item, its hierarchical structure, complexity, and resources allocated.

Data - 6 C. b. 44-1			E/A	Description
Date of Submittal	①	F-6		Current date, either project initiation, work plan formation or change in work plan definition, in the format yymmdd.
Project Identifier	2	F-8		An acryonym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Product Identifier	(3)	F-8		A name or number uniquely identifying the configuration item or product.
Product Mod Number	4	F-2		Modification number, reflecting the sequence of product evolution.
Product Version Number	(5)	F-2		The model or build numbers, reflecting the sequence of product releases.
Product Type	(6)	F-12		The general class of the product described. Choices include:
1				Document - All written material.
				Program - Systems, subsystems, pro- grams.
				Data - Data base
				Test - Test case
				Services - Data processing related services.
				Other - None of the above.

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W2-1 PRODUCT IDENTIFICATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Reporting Level	0	F-9	\$ 11 ¹	Level of software configuration. Choices include:
	901808 901808 96490	0 0605 0 0805 00 050		Module - A software entity that is discrete and identifiable with respect to designing, compil- ing and loading.
to favoi dixelenso to favoi dixelenso to madeno sili antizza propina	en chi an chi orsed a craeces (Recina			Subsystem - A subordinate system, consisting of one or more interacting modules (It is usually capable of operating independently of, or synchro- nously with, a controlling system.)
	sy, 10 weksi a at be a lactori	e e l e e los e encer e belle entebel		System - An organized set of software modules and/or subsystems, data base elements, and user prodcedures created to perform a set of specific functions.
Product Description	(8)	V-256		A short narrative description of the configuration item or product including the objective, function, general composition and/or operation.
Identifiers of Product Compon- ents	9	F-8	Х	Identification by identifier of all components of the next lower hierarchy of products, if any.
Work Unit	100	F-10		The unit by which work productivity on this product is measured, e.g., lines of source or object code, pages of documentation, records of data, manhours of work service.
Size	Û	F-8	X	The number of Work Units required to produce the specified product.

W2-1 PRODUCT IDENTIFICATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Cost	(12)	F-8	X	The value of the resources expended in the production of the product. (If more than one type of resource is expended, resource values should be reduced to common base such as dollars.)
Programming Language Identifier	(13)	F-12	X	The name or designator for the language in which the product is written, if applicable.
Product Complexity	14	F-2	X	An estimate of the complexity level of the product based on the number of product interfaces and/or processing decisions. (Rating scale is 1-10, where 1 = easy, 10 = most difficulty.
Programming Technique Identifier(s)		F-20	X	A list of the titles of the programming technique(s) used. (All techniques specified must be described on the P9 Programming Techniques Information Form.)

W3-1 PROJECT PERFORMANCE INFORMATION FORM

DATE OF ORGANIZA	SUBMITTAL: ATION IDENT	(1) IFIER: ③	PROJECT IDENT	IFIER: (2)	
		PRO	DOUCTION DATA		
WORK ID	PRODUCT ID	RESOURCE ID	RESOURCE UNITS EXPENDED	WORK UNITS PRODUCED	PRODUCT STATUS
4	(5)	6	7	(8)	9
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			00 of 7 (8)	58	00000
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		on base see No deed to b	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
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W3-1 PROJECT PERFORMANCE INFORMATION FORM

To be completed and submitted at the end of each reporting period (A reporting period of no greater than one month is recommended.) The information reported must indicate the work progress and resource expenditures for the reporting period, and should not reflect information reported in a previous reporting period. This form provides information on resource expenditures, productivity data, and work and product status.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	(2)	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Organization Identifier	3	F-8	A short acronym or number that uniquely defines the organizational unit, and for which resource data may be accumumulated.
Work Identifier/ Product Identifier	4)6	F-8 } F-8 }	The combination of the work and product identifiers together form a unique acronym, number or name by which total expenditures for the product and/or work element and/or organizational unit may be accumulated. All work elements and/or products for which progress was made, or resources expended, during the reporting period must be listed.
Resource Identifier	(6)	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type, travel type, computer time, storage, etc. All resources expended during the reporting period must be listed.
Resource Units Expended	(Z)	F-10	The number of resource units (e.g., computer time, manpower) spent during the reporting period. (The unit of measure has previously been identified on the WI form, and need not be specified.)
Work Units Produced	8	F-10	The amount of work units (e.g., lines of source code, pages of documentation) produced during the reporting period. (The unit of measure has previously been identified on the W2 form, and need not be specified.)

W3-1 PROJECT PERFORMANCE INFORMATION FORM (cont'd)

Parameter	Key	Format	Description
Product Status	9	F-10	The level of work accomplished for the product during the reporting period. Choices include:
	77 th 1	g ar s	Started - Work was initiated
			Continuing - Work is continuing
	710	RE-3011	Completed - Work is completed
O.	ито Еду	arteert	Milestone - Indication that the milestone for this work element was successfully passed.
			ECORDISSE RANDOS RING CRO CALCOS.
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	The same	N 2 2 2 4 2 14	N 1987 - 170 - 170 - 1700

W4-1 SOFTWARE PROBLEM REPORT (SPR)

DATE OF SUBMITTAL: PROJECT IDENTIFIER: SPR IDENTIFIER: SPR TYPE: 4 FR DC MC EF ED EC
DATE OF PROBLEM DISCOVERY: 6 TIME OF DAY: 7
WORK IDENTIFIER IN PROGRESS: 8
STATUS: OPEN COSED PENDING OTHER PRODUCTS IMPACTED BY PROBLEM: OPENDING OTHER OT
PRODUCTS USED WHEN PROBLEM OCCURRED:
Data Base Identifier: (11)
Test Case Identifier: (12)
Test Tool Identifier: (13)
PROBLEM DESCRIPTION: (14)
DATE RECEIVED: (15) EMPLOYEE ASSIGNED: (16)

W4-1 SOFTWARE PROBLEM REPORT (SPR)

To be completed and submitted to the project office by project personnel when a problem is discovered in the software or other associated product items. The SPR is submitted to the RADC repository at the established reporting period. This form provides information on discrepancies found in any configuration item.

Key	Format	Description
①	F-6	Current date of reporting period, in the format yymmdd.
2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
3	F-8	A unique number, name or other identifier assigned by the project configuration management office or project office. Assigned to SPR's in sequence; current military practices use the following conventions:
	12,000	ECPxxx - Engineering Change Proposal for changes.
		SPRxxx - Software Problem Report for corrections.
		DRFxxx - Discrepancy Report Form for corrections (If the SPR or DRF results in a requirements or design change, an ECP is generated.)
•	F-2	The general class of problem involved. Sample choices include:
o hide o hide out so oue suc toos oue goos	ententi ration be ration be ration	FR - Changes in functional requirements DC - Changes in designed configuration MC - Changes to a finished product EF - Errors in a functional analysis or requirement ED - Errors in a proposed design EC - Errors in a finished product
(5)	F-8	A name or number uniquely identifying the project member. (To be used by project office only).
	① ② ③	② F-8 ③ F-8

W4-1 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Date of Problem Discovery	6	F-6	Date the problem is discovered by the project employee, in the form yymmdd.
Time	1	F-4	Exact time of day on the above date that the problem was discovered, in the form themm.
Work Identifier in Progress	8	F-8	Identification of the work element in progress during which the problem was discovered. In the event that separate testing periods were not identified as activities on the WI - Work Definition Form, the following test periods are suggested:
	2004	03, 000 03, 000 0674, 750 1, 2007,20	U - Unit (or module) test I - Integration test S - System test A - Acceptance test O - Site or installation test
Status	9	F-8	Indication of the action taken by the project manager's office. Choices include:
	1 1301.03		OPEN - Problem is being studied to determine the appropriate action.
		Total S	CLOSED - Problem is fixed.
			PENDING - Problem is deferred, not reproducible, or of low priority.
		a portion of	OTHER - Explain below.
Product(s) Impacted by Problem	10	F-8	Id(s) of the product elements that appear to be involved in the problem. (Include mod and version number where appropriate.)
Data Base Identifier	①	F-8	Id of data base used when problem was discovered, if applicable.
Test Case Identifier	12	F-8	Id of test case used which demonstrated the error, if applicable.
Test Tool Identifier	13	F-8	Id of test tool, driver or other program used which demonstrated the error, if applicable.
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W4-1 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Problem Description	(14)	V-256	Description of the problem, including the symptoms, and possible impact on other product or work elements.
Date Received	15)	F-6	Date the SPR was received by project manager's office and assigned to project personnel for appropriate action, in the format yymmdd, if applicable.
Employee Assigned	6	F-8	A name or number uniquely identifying the project member responsible for correction. (To be used by project
			office only.)
			RESOURCE UTILITATING CAFAL IN Macqueux
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			(13) - 01/1533 - 17/1

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W5-1 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

		.,				
DATE OF SUB	MITTAL:	0		PROJECT	IDENTIFIER:	2
SMT IDENTIF	IER: _	3		DATE OF	CORRECTION:	(4)
TIME OF DAY	OF CORR	ECTION	l: <u>(</u> 5)			- 100 Table 1997
EMPLOYEE ID	ENTIFIER		6			
SPR(s) RESO		5900	7			Ray (Graff Johns)
31 K(3) K230						
	0.0	NEU		ODIFICATIO AMOUNT		1 1004
PRODUCT IDENTIFIER	OL D MOD	NEW MOD	UNIT OF CHANGE	CHANGE	DIFFICULTY RATING	WORK IDENTIFIER
8	9	(0)	0	12	13	(4)
RESOURCE UT	ILIZATIO	N DATA	:			
Manpower:	(5) _					
CPU Time: (16)						
WORK IDENTIFIER IN PROGRESS WHEN ERROR GENERATED: (17)						
ERROR TYPE:			55 mich 211	ion denem		
		rator	User Re	equests [Computation	nal []
	Data Base Departor User Requests Computational Design Documentation I/O Global Data Definition					
Data Handling Documentation Routine/System Interface Hardware						
						ort Interface
Configurat	:10n	Kequ	rements Co	mpliance [Tape Proc	essing [
TYPE OF SOFT	WARE TE	RMINAT	10N:19Norn	na1 🗌	Abnormal 🗌	
ERROR DESCRI	PTION:	20)				
	•					
DATE RECEIVE	D: (21)_					

W5-1 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

To be completed and submitted to the project office upon successful software modification by the responsible employee. The SMT is submitted to the repository at the established reporting period.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	(2)	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
SMT Identifier	(3)	F-8	An alphanumeric identifier uniquely identifying a change or package of changes to a product. (The identifier is normally composed of a set of initials identifying the type of change package and a number indicating the sequential number of the change.) Existing military practices adhere to the following conventions:
es somenta la nacional Filtra e e periodo estrado 2016: En forcesa sel priodo do estrado			VDDXXX - A Version Description Document accompanying a new model or release of a system specifying which changes have been incorporated to which models of the system.
photicus actions as some actions and actions are some actions as a some action action actions are a some action action action actions are a some action action action action action action actions action action action action action action action action actions action ac		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SCNXXX - A Specification Change Notice accompanying a package of change pages to a design specification, test plan or other document.
		y 1 to 98	CRXXX - A Change Report covering a series of Class II (non-cost, non-impact) changes that have been made to the system.
Date of Correction	4	F-6	The calendar date the error was corrected, in the format yymmdd.
Time of Day of Correction	5	F-4	The time of day on the above date the error was corrected, in the format hh:mm.
Employee Identifier	6	F-8	The name or number of the employees responsible for modification. (To be used by project office only.)

W5-1 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

Parameter	Key	Format	Description	
SPR's Resolved	7	F-8	A list of Software Problem Report Identifiers that this modification package resolves, or partially resolves. (If the SPR is partially resolved, a P should be appended to the SPR number, e.g., CR123P.)	
Product Identifier	(8)	F-8	The name(s) of the product items containing or impacted by the error. When the error is found to be in more than one product, list all products, e.g., documents, data base.	
01d Mod	(9)	F-2	Modification number of the product containing the error.	
New Mod	10)	F-2	New modification number assigned to the product being altered, if applicable.	
Unit of Change	(<u>ii</u>)	F-10	The unit used to measure the size of a change, as lines of code, or pages of documents.	
Amount Change	12)	F-8	The volume and direction of change as a result of the modification, + = addition, - = deletion, / = change.	
Difficulty Rating	(13)	F-2	An evaluation of the degree of difficulty in implementing the change. Rating scale is 1-10, where I = easy, IO = extremely difficult. (The difficulty rating should be estimated with regard to the impact the error had on the specific product.)	
Work Identifier	(14)	F-8	Name of the work element in progress for the specific product when the correction was made.	
Manpower Resource Data	(15)	F-4	Indicate in number of manhours the manpower resource needed to correct and install the software modification.	
CPU Time	(16)	F-4	The exact amount of CPU time in minutes used to correct the error.	
Work Identifier in Progress when Error Generated		F-8	Identify as near as possible the work element in progress in which the error was generated.	

W5-1 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

Parameter	Key	Format	Description
Error Type	18	F-28	Identify the error type within the given error categories that best fits this error.
Type of Software Termination	19	F-8	Indicate how the software terminated processing when the error occurred.
	SMS	CT&C 190	NORMAL - Normal processor termination
			ABNORMAL - Abnormal process termination
Error Description	20	V-256	Description of the error, including the accuracy of the error description on the associated SPR(s).
Date Received	21)	F-6	Date the project manager's office received the SMT, in the format yymmdd.
,			
ľ			

W6-1 SOFTWARE OPERATIONS LOG

.0G	PRODUCT	COM	PUTER DATE	JOB	ACCE	PTANCE	COMPUTER	COMPLETION	CPU TIM
ATE	IDS	MO	DAY	HR	MIN	SEC	- OPERATIONS	CODE	MIN SEC
4	(5)			6			(1)	8	9
bba	os (1 to 31 m					2.5 avi 2.7 avi			nevi da
						•			

W6-1 SOFTWARE OPERATION LOG

To be completed and submitted by the project librarian, or data collection clerk, in the event that a software monitor does not automatically collect computer run information. The data should be submitted to the RADC Repository at the established reporting period.

 (1) (2) (3) (4) (5) 	F-6 F-8 F-24	The current date of the reporting period, in the form yymmdd. An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project. The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number. The current calendar date of the
34	F-24	that uniquely specifies a project and identifies all data collection forms for the project. The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.
4		employed, including the manufacturer of the equipment, the series number, and the model number.
	F-6	The current calendar date of the
(5)		computer operations, in the form yymmdd.
(5)	F-8	A name or other identifier specifying the products being tested in the computer job.
6	F-10	The date and time of day the job was accepted by the computer, mmddhhmmss.
1	F-24	A list of each job step or type of computer operations performed in this job
8	F-4	The status indicator for the job step or computer operation in the job. (Completion code identification may be input by the D1 form.)
9	F-6	The total time used by each job step or operation in this job. mmss.
	(7)(8)	7 F-24 8 F-4

D1 COMPUTER OPERATIONS IDENTIFICATION FORM

DATE OF SUBMITTAL: DEVICE IDENTIFIER: 3	PROJECT II	DENTIFIER: 2
COMPUTER OPERATIONS IDENTIFIERS	COMPLETION CODE	DESCRIPTION
(4)	(5)	6
The STORY ST		1911 (1911 (1911 (1911
		to describe to the second of t
		doll victorials
		Sid (5) Macon Caroline Sid (5) S
		3. (g) w) t 10.

D1-1 COMPUTER OPERATIONS IDENTIFICATION FORM

To be completed and submitted by the project librarian or equivalent prior to computer usage by project personnel. This form defines the computer operations and associated completion codes for each computing device used.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Prior to completion of the W6 - Software Operations Log, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer, the series number, and the model number.
Computer Operations Identifiers	4	F-12	The name of the computer operations available for use by project personnel.
Completion Codes	(5)	F-4	The alpha or numeric completion code associated with the specified computer operations.
Description	6	V-256	A description of the meaning of the specified completion code for the specified computer operation.

ATTACHMENT 1 - SKILL LEVEL CLASSIFICATION

The skill level positions herein defined represent eight typical data processing positions, two non-exempt and six exempt, two of which include management roles. Due to the wide range of positions found in the software industry, these positions have been chosen as a subset of the entire set. The objective of defining skill levels as a separate attachment allows for flexibility in these definitions, as well as allowing for expansion or contraction of skill levels as the need becomes apparent.

DEFINITION OF NON-EXEMPT JOBS:

POSITION I:

Performs basic clerical assignments required in the data processing cycle such as assisting in the updating of data processing source reference files, translating verbal or graphic data into codes, and/or assisting in reviewing data processing documents before and after machine production.

Typical Duties:

Maintains updated data processing source reference files, as directed, by performing such duties as assembling, sorting and reducing pertinent data in accordance with established data processing procedures. Also, prepares graphic or tabular statistical presentations and summaries. Translates verbal, graphic, and other data into standard machine acceptable codes. Assists in the review of various data processing documents before and after machine processing as well as the punched card and other reference files for the purpose of eliminating clerical or system errors. Reviews items such as code identification, legibility, completeness, continuity, and conformance to establish data processing specifications.

Comments:

Requires the ability to operate typewriter, adding machine, calculator, keypunch, or similar machines. Requires the ability to maintain a very high degree of accuracy and legibility in code and symbol manipulation. Requires the ability to apply a very broad variety of arbitrary codes and translate into compatible machine codes. Requires the ability to perform detailed work accurately, and to reduce voluminous material into useful data. Requires the ability to effectively document, disseminate, and correlate technical data.

POSITION II:

Performs program production library assignments, including gathering, filing, and distributing technical documents and other data, maintaining computer programs pertinent to library operations, and producing automated library catalogs.

Typical Duties:

Performs tasks associated with library operations to include procuring, indexing and filing pertinent documents, coding data for producing the library catalog, preparing special and source listings, and storing, handling, and regulating the flow of documents among users. Coordinates with users to collect program decks, listings, magnetic tapes, paper tapes, and documentation for the library; incorporates these materials into the library's computer based catalog system. Reviews user's submittals to the library to verify accuracy and content in accordance with computer system specifications and restrictions; accepts or rejects submittals to the library on the basis of this review, and coordinates with the submitter to resolve problems.

Comments:

Normally requires at least one year experience in data processing. Requires a general knowledge of project activities and a knowledge of library operations, cataloging, users' documentation systems, and the ability to interact and coordinate with internal and external users. May require the ability to use the following equipment: computer terminal and peripheral equipment, calculator, and typewriter.

DEFINITION OF PROGRAMMER POSITION LEVELS:

POSITION III:

Develops fundamental programming skills by receiving instructions in basic principles and techniques of EDP, most frequently through on-job training.

Typical Duties:

Prepares detailed flow charts from general program statements; translates flow charts into assembly or compiler languages; develops test data and routines which he applies to checking out his program; documents the procedures used in standard terminology. Requires direct constant supervision, with particular emphasis on technical training and professional development.

Comments:

Includes persons who have completed initial orientation with introductory training courses as well as those who are beginning to perform as professional programmers. Average programming experience: 1-1.5 years.

POSITION IV:

Performs all functions of digital computer programming. Continues extensive development of programming skills and techniques through greater variety of work assignments, broader level of responsibility, and increased complexity of assignment.

Typical duties:

Reviews and interprets basic systems designs and specifications; creates general, as well as detailed, complex flow charts; translates complex flow charts into assembly or compiler languages; develops test data and routines required for program checkout; documents all procedures utilized by the program. Requires direct supervision with continuing emphasis on technical training and development.

Comments:

Performs as the journeyman applications programmer, handling modification and adaption of existing programs, as well as writing new programs that utilize standard procedures and techniques. Frequently assigned to activities such as payroll, inventory control, engineering statistics, personnel, etc. Average programming experience: 3-4 years.

POSITION V:

Concentrates general programming experience into specialized skills area such as: design, formulation, or implementation of complex computer programs and systems.

Typical duties:

Establishes program system elements needed to achieve specific objectives sought by each organizational unit concerned; reviews hardware capabilities and new technological changes; determines cost and quality choices as a basis for measuring the feasibility of various programming system approches; submits, for management approval, proposals for new or revised programming systems; formulates design specifications to meet the objectives of new or revised systems; writes general and/or detailed flow charts for major new or revised complex programming systems. Requires general supervision.

Comments:

Depth experience provides the basis for specialization; permits the programmer to build efficiencies and economies into the complete computer operation. For most computer user installations this would represent the highest level of programming required.

POSITION VI:

Researches "first-time" approaches and techniques for application to original or established computer programming systems, utilizing advanced knowledge of scientific, mathematical, or economic disciplines and an expanding understanding of computer methodology and technology. Commands the ability to exercise advanced creativity and inventiveness in the development and design of original, major computer programming systems.

Typical duties:

Specifies general programming design concepts for "first-time" programming systems; conducts research in automation techniques which significantly extends the state of the art; recommends new or revised hardware capabilities which result in significant changes to general programming activities; acts as senior programming systems consultant in advanced computer system technology; consults with computer design engineers in the development of original hardware systems. Requires minimum supervision.

Comments:

Frequently, an "individual contributor" functioning at a level equal to, or above, the typical first level of data processing management. Works at the highest level of creativity and originality. This activity is rarely found in computer installations of commercial organizations. In total, the population of POSITION V probably does not exceed 5 percent of the programming profession.

DEFINITION OF MANAGEMENT POSITION LEVELS

POSITION VII:

Organizes and directs a technical aspect of a project or program concerned with the design, development, and implementation of existing and/or proposed operational and/or support systems.

Typical duties:

Responsible for the technical direction of project or program activities, but may not be required to supervise others permanently and administratively. Directs project/program by planning, organizing, and coordinating the development and implementation of new or ongoing technical activities; assigns specific work objectives; may supervise others.

Comments:

Usually in charge of a specific functional or operational area or a section of the total project, especially in large programming projects. Average experience exceeds eight years.

POSITION VIII:

Responsible for supervising and providing over-all technical guidance to a project or program staff concerned with the design and/or development, integration, and implementation of existing and/or proposed operational and/or support systems; may participate in technical and administrative planning for his corporate organization, and may represent his Division/Department Manager as a corporate spokesman in matters relative to project or program commitments. Organizes, establishes the objectives for, and defines the over-all work efforts of the project/program staff; insures that on-going activities conform with predetermined objectives and/or contractual requirements and complement the functions of departmental branches.

Comments:

This level of management will have at least one Position VII on their staff, and will normally be more experienced than Position VII. Also, this position requires the capability of providing frequent and effective technical direction on the most complex activities. Generally, managers will become highly involved in the development of new concepts and interdisciplinary technological applications covering a wide scope of operations.

2.2 DATA COLLECTION FORMS - GROUP 2

The following data collection forms comprise Group 2 for collecting a medium volume of data parameters. These data support the same studies as Group 1, but include a wider range of topics important to the software development process, as discussed in Volume 003 of the Data Collection Study. Many of the forms and associated instructions are identical to Group 1, but are presented as an entire set in order to clarify the alternatives existing within the data collection system. Group 2 consists of the following forms:

- P1 Project Environment
- P2 Contract/Customer
- P3 Software Installation*
- P4 Subcontractor*
- P5 Organization
- P6 Employee
- P7 Computer Equipment
- P8 Computer Support Facilities
- P9 Programming Techniques
- P10 Programming Language
- P11 Program Production Library*
- Wl Work Definition
- W2 Product Identification
- W3 Project Performance
- W4 Software Problem Report
- W5 Software Modification Transmittal
- W6 Software Operations Log
- W7 Job Identification
- W8 Milestone Identification
- D1 Computer Operations

Attachment 1 - Skill Level Classificiation

^{*}If applicable.

P1-2 PROJECT ENVIRONMENT INFORMATION FORM

DATE OF SUBMITTAL: 1 TITLE: (3)	PROJECT IDENTIFIER: (2)
DESCRIPTION: 4	Subfalls and After Administration of the San Control
000000000000000000000000000000000000000	
START DATE: (5)	END DATE: 6
CONTROL AUTHORITY:	NUMBER OF CONTRACTORS: 8
PROJECT SIZE ESTIMATES	Later Too I was transported to
Total Manpower: 9	
Total Pages Documentation: (10)	
Total Number Program Modules: (1))
Total Number Subsystems: (12)	
Total Number Source Statements in	
Total Number Source Statements in	
Total Number Object Statements in	
Total Number Object Statements in	Support Software: (16)
Total Number Bytes in Data Base:	(1)
PROJECT COMPLEXITY ESTIMATES	
Overall Project: (18)	Application Software: (19
Control/Operating System: 20	Support System/Tools/Aids: 21
Data Base Structure: (22)	100000 1000
PROJECT EVALUATION RATINGS	
Quality of Requirements Specifica	tions: (23)
Quality of Design Specifications:	2
Schedule Adequacy: (25)	
Overall Project Management Effect	iveness: 26
Overall Project Personnel Qualifi	cations: (27)
Computer Resources Adequacy: (28)_	The second second second second
Quality of Customer Supplied Info	rmation: 29
Timeliness of Review Actions: 30)
Funding Adequacy: 31	Cperetions:
PROJECT SOFTWARE TYPE: 32 BUSINE	SS SCIENTIFIC SYSTEMS
MAINTE	NANCE OTHER L.

P1 3 PROJECT ATTRIBUTES INFORMATION FORM

To be completed and submitted at initiation and completion of the software development project. This form defines the reporting project, the project size, software complexity, and adequacy of other project specific parameters.

Parameter	Key	Format	E/A	Description
Date of Submittal	1 DASTEM	F-6		Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Title	3	F-16		A short name or descriptive title for the project.
Description	4	V-256	enti Guiz	A brief narrative description of the software development project, covering its objectives, scope and approach.
Start Date	(5)	F-6	800	Date project is initiated.
End Date	(5) (6)	F-6	X	Date project is to terminate.
Control Authority	1	F-10		The name or phrase characterizing the customer's configuration control agency, e.g., SPO, CCB, project monitor, etc.
Number of Sub- contractors	8	F-4	Х	Total number of subcontractors partici pating in software development project
Total Manpower	9	F-8	X	The number of man years required for the software project.
Total Pages of Documentation	10	F-8	X	The total number pages of documentation to be produced during the performance of the project.
Total Number Program Modules	1)	F-8	X	The total number of modules to be produced during the performance of the project.
Total Number Subsystems	(13)	F-8	X	The total number of subsystems to be produced during the performance of the project.
Total Number Operational Source State- ments	(3)	F-8		The number of deliverable POL state- ments in the operational system.

P1-2 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description	
Total Number Support Source Statements	14	F-8	X	The number of deliverable POL state- ments in the support software.	
Total Number Operational Object Instruc- tions	15)	F-8	X	The number of deliverable MOL state- ments in the operational system.	
Total Number Support Object Instructions	16)	F-8	X	The number deliverable MOL statements in the support software.	
Total Number Bytes in Data Base	17	F-8	X	The number of bytes of storage required for data storage.	
Overall Project Complexity	®	F-2	X	An evaluation of the degree of complexity of the project, independent from the complexity of the software produced. (This evaluation should consider such factors as the number of coordination points, number of subcontractors, number of agencies per product, number of internal coordination points, number disciplines involved, number and variety of products produced, number and variety of information sources.) Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Application Software Complexity	19	F-2	X	A complexity rating for the known characteristics of the solution algorithm software being developed. Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Control/Operating System Complexity	@	F-2	X	A complexity rating of the control software or operating system, eithe being developed or used by the soft ware development project. Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Support System/ Tools/ Aids Complexity	a	F-2	X	A rating of the complexity in the use, interactions and/or documentation of the support software. Rating scale is 1-10, where 1 = easy, 10 = most difficulty.	

P1-2 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Data Base Structure Complexity	22	F-2	X	A rating of the complexity of the data base, size and structure. Ratine scale is 1-10, where 1 = easy, 10 = most difficult.
Quality of Requirement Specifications	(23)	F-2		An evaluation of the clarity, compleness, implementability and verifiability of the project requirement specifications. Rating scale is 1-10, where 1 = very high quality, 10 = poor quality.
Quality of Design Specifications	(24)	F-2	X	An evaluation of the design specifications for their completeness, clarity, and detail. Rating scale is 1-10, where 1 = high quality; 10 = low
Schedule Adequacy	(25)	F-2	X	quality. An evaluation of the tightness of project scheduling in view of the total project. Rating scale is 1-10, where 1 = adequate, 10 = inadequate.
Overall Project Management Effectiveness	(26)	F-2	Х	An evaluation of the management control of the project based on the stringency of administrative plans, configuration control procedures, technical direction given, etc. Rating scale is 1-10, where l = effective management, l0 = ineffective management.
Overall Project Personnel Qualifications	(27)	F-2	X	An evaluation of the project personnel, including management, technical and administrative support people, in meeting the projects performance goals. Rating scale is 1-10, where 1 = highly qualified, 10 = poorly qualified.
Computer Resources Adequacy	(28)	F-2	X	An evaluation of the computer resources and services to meet the requirements of the project. Rating scale is 1-10, where 1 = most adequate, 10 = highly inadequate.
Customer Supplied Information	(29)	F-2	X	An evaluation of the customer supplied data and/or equipment based on the completeness, timeliness and accuracy (freedom from errors and deficiencies). Rating scale is 1-10, where 1 = high quality, 10 = poor quality.

P1-2 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Timeliness of Review Actions	30	F-2	X	An evaluation of the length of time it takes to process an item through the review and approval cycle, especially in terms of exceeding scheduled review periods and priority, importance or immediacy of the need for a decision. Rating scale is 1-10, where 1 = most expedient, 10 = most time consuming.
Funding Adequacy	(3)	F-2	X	An evaluation of the adequacy of project funds to meet the software deliverable end items. Rating scale is 1-10, where 1 = adequate, 10 = most inadequate.
Project Software Type	(32)	F-12		Indicate the gross classification of programming. Choices include:
				BUSINESS SCIENTIFIC SYSTEMS MAINTENANCE OTHER
				Paylinection Rate: (1)

P2-2 CONTRACT/CUSTOMER INFORMATION FORM

DATE OF SUBMITTAL:	PROJECT IDEN	TIFIER:	2
CONTRACT TYPE FFP FPI COST LABOR FPE FPIF T-M OVH IRAD		CFFF C	
CUSTOMER EXPERIENCE WITH DATA PROCESSIN CUSTOMER EXPERIENCE WITH APPLICATION: (CUSTOMER EXPERIENCE WITH TARGET COMPUTE CUSTOMER EXPERIENCE WITH CONTRACTOR: 7	5		
CUSTOMER/CONTRACT EVALUATION RATINGS Stringency of Review Procedures: 8 Reasonable of Negotiations: 9 Technical Risk: 10 Redirection Rate: 11			

P2-2 CONTRACT/CUSTOMER INFORMATION FORM

To be completed and submitted at initiation and completion of the software development project. This form defines the contract terms, conditions, and customer related information. (The information on this form is not appropriate for IRAD and overhead funded software projects.)

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either project initiation or completion, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other ident that uniquely specifies a project and identifies all data collection forms for the project.	
Contract Type	3	F-5		The types of contract under which the work is performed, including:
the formulation of government in antity and form in antity and formulation and antity and an antity and antity are an antity are and antity are an antity ar	P To Test BdJ a BdJ a Bdr d Bde d Bd d Bd	richter interferenden in der State von der S	0A 9940 1095 1106 237 237 237 240 241 241 241 241 241 241 241 241 241 241	FFP - Firm Fixed Price FP-E - Fixed Price with Escalation FPI - Fixed Price Incentive FPIF - Fixed Price Incentive Free COST - Cost with no Fee CS - Cost Shared with Customer CPIF - Cost Plus Incentive Fee CPAF - Cost Plus Award Fee CPFF - Cost Plus Fixed Fee T&M - Time and Materials LABOR - Labor costs only IRAD - Independent Research and Development OVH - Overhead Other - None of the above
Customer Experience with Data Processing	4	F-3.1		Years of experience the customer has had in applying data processing to his operational problems.
Customer Experience with Application	(5)	F-3.1		Years of experience dealing with this particular application area.
Customer Experience with Target Computer	6	F-3.1		Years of experience customer has had with the specific hardware equipment.
Customer Experience with Contractor	7	F-3.1		Years of customer interaction with this contractor.

P2-2 CONTRACTOR/CUSTOMER INFORMATION FORM (cont'd)

Paramter	Key	Format	E/A	Description
Stringency of Review Procedures	8	F-2	X	An evaluation of the customer's method's of approval and review of plans, specifications, and modification requests in terms of the severity or stringency of the procedures and the strictness with which they are observed. Rating scale is 1-10, where l = most reasonable, 10 = most stringent.
Reasonableness of Negotiations	(9)	F-2	X	An evaluation of the reasonableness of the review and inspection process, and in settling disagreements. Rating scale is 1-10, where 1 = most reasonable, 10 = most unreasonable.
Technical Risk	10	F-2	X	An evaluation of the feasibility of meeting technical performance requirements based on the familiarity and difficulty of the problem and availability of technical skills. Rating scale is 1-10, where I = low technical risk, 10 = high technical risk.
Redirection Rate	Û	F-2	X	An evaluation of the frequency with which the project is redirected or given a new task to perform, or an existing task cancelled. Rating scale is 1-10, where 1 = little or no redirection, 10 = continual redirection.
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101 E 12 DE 18 SE				- 1.6-1 (8)
ban				
sauter our sugation				
n the collector	10.10	1915 10 11 18 Y 1910		

P3-2 SOFTWARE INSTALLATION INFORMATION FORM

DATE OF SUBMITTAL: ① PROJECT COMPUTER: ③ TEST [INSTALLATION TECHNIQUE: ④ PARALLEL [] NUMBER PERSONNEL IN INSTALLATION TEAM: ⑤ AVERAGE EXPERIENCE OF INSTALLATION TEAM: ⑥ ON SITE TRAINING: ⑦ NONE [] MANUMEXERCISE [] SOFTWARE ADAPTATION: ⑧ RESOURCE REQUIREMENTS FOR INSTALLATION: ⑨ INSTALLATION DIFFICULTY RATING: ① PROBLEM(S) DESCRIPTION: ①	FIELD SWITCH BRIEF	B	MULTI [] ACKUP]
The state of least sentines and the state of			
this environment is a continue of the continue			

P3-2 SOFTWARE INSTALLATION INFORMATION FORM

To be completed and submitted at project initiation and completion in the case where software is being developed at a location different than the operational site of the software. This information provides data on the techniques, personnel, resources, and problems of software installation.

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initia- tion or software installation comple- tion, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Location of Target Computer	(3)	F-6		Check the type of dislocation between development facility and the operational facility. Choices include: TEST - The software is delivered to. or checked out, in a test facility different than the developmental facility. FIELD - The software must be installed in an operational facility located at some distance. MULTI - The software must be installed at several field locations or delivered to many users.
Installation Technique	4	F-8	x	Check the method used to integrate new software into ongoing operations. Choices include: PARALLEL - Both the old and the new system operate in parallel for a period. SWITCH - Operations are switched to the new system without recourse. BACKUP - The old system is retained as a fallback capability in case the new system fails.
Number Personnel in Installation Team	(5)	F-4	X	Number of project personnel required to install the new software system on site.
Average Experience of Installation Team	6	F-4	X	The amount of experience in number of months the installation team has with the software system and/or customer and site.

P3-2 SOFTWARE INSTALLATION FORM (cont'd)

Key	Format	E/A	Description
7	F-10	X	Check the method(s) or orientation required to institute operations on the new system. Choices include: NONE No training is required. MANUAL Training manuals or other instructional materials provided. BRIEF Orientation and indoctrination briefings are prepare and presented. LECTURE A series of classroom presentations with audiovisual aids are required. EXERCISE Hands-on training with canned or simulated problems is required.
8	F-4	X	The amount of adaptation (change) that must be done to adapt the software to run on the operational (target) computer, as an approximate in percent of code change.
(9)	F-8	X	Total resources budgeted (and spent) for adaptation, training, travel, etc. for software installation, in dollars.
1	F-2	X	An evaluation of the impact the installation of the software system has on overall project performance, considering factors such as multiple releases, parallel systems, customer support and/or training. Rating scale is 1-10 where 1 = easy, 10 = most difficult.
0	V-256		Short description of all problems, any, that occurred during the software installation process. (If SPR's are submitted during the installation process, list the SPR identifiers.)
	(a) (a) (d)	(9) F-8(10) F-2	 F-10 X F-4 X F-8 X F-2 X

P4-2 SUBCONTRACTOR INFORMATION FORM

DATE OF SUBMITTAL: 1 SUBCONTRACTOR IDENTIFIER: 3 SUBCONTRACTOR TYPE: 4 RESPONSIBILITIES: 5	PROJECT	IDEN	TIFIER:	2
EXPERIENCE IN DATA PROCESSING: 6	10)			ansuri 7 c
	,			

P4-2 SUBCONTRACTOR INFORMATION FORM

To be completed and submitted at project initiation and completion for each subcontractor associated with the software development project. This information provides data on subcontractor responsibilities, interfaces, and quality of material furnished.

Parameters	Key	Format	E/A	Description
Date of Submittal	D	F-6		Current date, either project initia- tion or completion, in the format yymmdd.
Project Identifier	3	F-8		An acronym, number or other identified that uniquely identifies a project and identifies all data collection forms for the project.
Subcontractor Identifier	3	F-8		An acronym, number or other identification that uniquely identifies the subcontractor.
Subcontractor Type	4	F-10		A word or phrase identifying the type of service the subcontractor principally supplies.
Responsibilities	5	V-256		Short description of work performed by subcontractor.
Experience in Data Processing	6	F-3.1		Years of experience the subcontractor has had in applying data processing to operational problems.
Experience with Subcontractor	1	F-3.1		Years of interaction with this sub- contractor.
Experience with Application	(8)	F-3.1		Years of experience subcontractor has had in the application of the current nature.
Frequency of Contact	(9)	F-4	X	The closeness of liason with the sub- contractor, rated in terms of the average frequency of contact, with designation of the unit of time, d = daily, w = weekly, m = monthly, y = yearly.
Subcontractor Supplied Information	(19)	F-2	X	An evaulation of the subcontractor supplied software items and/or equipment based on the completeness, timeliness and accuracy (frestom from errors and deficiencies). Rating scale is 1-10, where 1 = good, 10 = poor.

P4-2 SUBCONTRACTOR INFORMATION FORM (cont'd)

Parameter Subcontractor Rapport	Key.	Format				otion
96	(1)	F-2	X	An evaluation of the degrand understanding with the tor based on the relative and number of conflicts a ments. Rating scale is 1		the degree of rapport with the subcontra- relative frequency flicts and disagree-
project laftha to etc seroot	adale .a ,estable	rrent du 10 uz ca mide		1 = good,	10 = poo	or.
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P5-2 ORGANIZATION INFORMATION FORM

DENTIFIERS	OF REPORTING ORGAN	IZATIONS: 6	1 (3) Treityanès	
B 101 H3 (3/3)		K ASSIGNMENT DATA		
WORK ID	INITIATION DATE	COMPLETION DATE	PERSONNEL SKILL LEVEL(S)	MANNING NUMBER
	(8)	9	10	
9000	ECHNIQUE(S) IDENTIF	TERS: 12		

P5-2 ORGANIZATION INFORMATION FORM

To be completed and submitted at project initiation and completion for each organizational unit. In the event that the organizational unit does not exist for the duration of the project, the form should be completed and submitted at the initial formation of the organizational unit and at the completion of the unit's assignment with regard to the specified project.

Parameter	Key	Format E/F	Description
Date of Submittal	0	F-6	Current date, either project initiation or completion date, yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Organization Identifier	3	F-8	A short acronym or number that uniquely defines the organizational element within the total project structure.
Organization Type	4	F-10	A short word or phrase describing the internal organization of the element. Sample choices are:
			LINE - A functionally specialized organization
			MATRIX/PM - Personnel in functionally specialized groups when coordinated by a project manager or PMO.
			MATRIX/P - Personnel from disicplinary or functionally specialized groups, assigned to a pro- ject for its duration and returned to the home group upon project termination.
			PROJECT - An organization formed to work on a specific project.
			PROJ/CPT - A specific internal project organization, utilizing a Chief Programmer Team.
			NONE - None of the above. (Described in ⑤ below.)

P5-2 ORGANIZATION INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Organization Responsibilities	(5)	V-256	X	A narrative description of the responsibilities of the organization, including the primary function of the organization, as analysis, design, program, test, configuration control, administrative management, computer operations.
Identifiers of Reporting Organizations	(6)	F-8	Х	A list of organizational identifiers that report to this organizational unit. (Each Identifier included must have a P5 Form associated with it.)
Work Identifier	(<u>)</u>	F-8	X	A name or number uniquely identifying this particular work element, and for which manpower, computer, etc., resources will be allocated. (Each Identifier included must have WI Form associated with it.)
Initiation Date	(8)	F-6	Х	Date work is to be initiated for the work element, yymmdd.
Completion Date	(9)	F-6	Х	Date work is to be completed for this work element, yymmdd.
Personnel Skill Level(s)	(19)	F-2	X	A number designating the level of skil of personnel within the organization for the specified work element. (See Attachment 1 for Personnel Skill Level Description).
Manning Number	Û	F-4	Х	The number of persons of the given personnel skill level assigned to the organizational element for the specified work element.
Managerial Techniques Identifier(s)	12	F-20	Х	The technique(s) used in the manage- ment of this organizational unit. Example techniques include:
				CPT - Chief Programmer Teams CM - Configuration Management PPL - Program Production Library BA - Build Approach AT - Automated Tools for Management Visability and Control

P6-2 EMPLOYEE INFORMATION FORM

DATE OF SUBMITTAL: EMPLOYEE IDENTIFIER: 3	301	T IDENT		2	13431.0000
SKILL LEVEL: 41 2 3 J JOB TITLE: 5 ORGANIZATION IDENTIFIER(S): 6	4 5 5	6	7	8 🗌	
YEARS EXPERIENCE In Nata Processing: ① With Project Programming Langua In Application Area: ② In Management: ① With Target Computer: ①	ge: 8				21 13 10 00 23 21 00 00 23 21 00 00 21 00
EDUCATION LEVEL: 12 HS YRS WORK IDENTIFIER(S):	COLLEGE	YRS			
					1 sp. 100 v 93 1 1 39/2
	25 A 5 3 2 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				15000000
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P6-2 EMPLOYEE INFORMATION FORM

To be completed and submitted for each employee when assigned to an organization within the project. This form provides information on employee past experience and current work assignments.

(1)	F-6		Current date, either project initia- tion or completion date, in the format yymmdd.
(2.	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
(3)	F-8		A name or number uniquely identifying the project member.
4	F-2		A short name or number designating the level of advancement or skill of the personnel within the organizational element. (See Attachment 1 for Skill Level Classification.)
(5)	F-20		A short descriptive phase identifying the position filled by the employee in the organization, e.g., Section Head, Chief Programmer, PPL Librarian, etc.
6	F-8	X	A short acronym or number that uniquely identifies the organizational element(s) to which this employee is assigned. (Each Identifier included must have a P5 Form associated with it).
(1)	F-3.1		The total number of years the employee has been engaged in the data processing field.
(8)	F-3.1		The total number of years experience employee has had with the programming language being used by the project.
(9	F-3.1		The total number of years experience the employee has had with the specific data processing application.
	(2) (3) (4) (5) (6)	(2) F-8 (3) F-8 (4) F-2 (5) F-20 (6) F-8 (7) F-3.1	(2) F-8 (3) F-8 (4) F-2 (5) F-20 (6) F-8 X (7) F-3.1

P6-2 EMPLOYEE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Years Experience in Management	10	F-3.1		The total number of years experience the employee has had in a position of management or equivalent responsibility.
Years Experience with Target Computer	①	F-3.1		The total number of years experience the employee has had with the object computer.
Education Level	12	F-3.1		The number of years of high school and college the employee has acquired (30 semester hours = 1 year).
Personnel's Work Identifier(s)	(13)	F-8	X	A name or number uniquely identifying the work element(s) to which the individual is assigned. (Each identifier included must have a Wl Form associated with it).
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P7-2 COMPUTER EQUIPMENT INFORMATION FORM

DATE OF SUBMITTAL:	PROJECT IDENTIFIER: (2)
DEVICE IDENTIFIER: 3	
DEVICE DESCRIPTION STATISTICS:	502 a. 611 a.s. 110 a.s. 120
Memory Size: 4	Unit of Measure: (5)
Number CPU's: 6	Number I/O Channels:(7)
Memory Cycle Time: 8	
Unit of Time Measure: 9 Nano 🗌	ficro Sec
DEVICE TYPE: (10) Mini Micro] Midi [] Maxi [] Special Purpose []
SECONDARY STORAGE STATISTICS:	
Number Tape Drives: (1)	
Number Random Access Devices: 12	2)
MAJOR INPUT DEVICE TYPE: (13) Card	
PRODUCT IDENTIFIERS: (14)	Tuper rape [
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P7-2 COMPUTER EQUIPMENT INFORMATION FORM

To be completed and submitted at project initiation for each computer configuration used by the project for software development. This form identifies the computer equipment capabilities.

Parameter	Key	Format E/F	Description
Date of Submittal	0	F-6	Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.
Memory Size	4	F-10	The amount of information the computer memory can store and base, e.g., 64K.
Unit of Measure	(5)	F-10	The unit by which the storage capacity is measured, e.g., bit, byte, word.
Number of CPU's	6	F-4	The total number of central processing units associated with the identified computer.
Number of I/O Channels	7	F-4	The number of hardware devices that connects the CPU and main storage with the I/O control units.
Memory Cycle Time	8	F-8	CPU cycle or access time.
Unit of Measure	9	F-5	The unit by which cycle time is measured, e.g., nanoseconds, microseconds, seconds.
Device Type	10)	F-7	The general classification of the computer equipment according to size.
			Mini - A computer with a portable mainframe. Micro - A computer that is micro-programmable and is also portable. Midi - A medium size computer, e.g., PDP10, IBM 360/20-370/158. Maxi - A large scale computer capable of multiprocessing, e.g., CDC 7600, IBM 370/191.

P7-2 COMPUTER EQUIPMENT INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Device Type (cont)				Special- Computer built to specific specifications for a particular application.
Number Sequential Access Devices	1)	F-6	368	Number of devices providing secondary storage of sequential access type, e.g., tape drives.
Number Random Access Devices	12	F-6		Number of devices providing secondary storage of random access type, e.g., discs, drums.
Major Input Device Type	(3)	F-10	TGC ptr	Type of input device that provides the major percentage of input data Choices include: Card - Punched cards Paper tape - Punched tape Terminal - Remote site input
Product Identifiers	(14)	F-8	80 J	Identifiers of product elements using this hardware device. This field may be left blank when a single computer device is used for the development of all products. In the event that more than one device is identified for software development, specify the highest level Product Identifier using the device, e.g., the subsystem name.

P8-2 COMPUTER SUPPORT FACILITIES INFORMATION FORM

DATE OF SUBMITTAL: 1 PROJECT IDENTIFIER: 2
LOCATION OF FACILITY: 3 DEDICATED _ CENTRAL _ TELE _ COURIER _
TRAVEL
MODE OF OPERATION: (4) BATCH BATCH-RJE INTERATIVE MIXED
DIRECT []
TURNAROUND TIME: 5 COMPUTER AVAILABILITY: 6
COMPUTER FACILITY EVALUATION RATINGS
Quality of Equipment and/or Related Services:
Quality of Operating System and Support Software: (8)
Quality of Operating System and Support Software Documentation: 9 DEVICE IDENTIFIER: 10
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P8-2 COMPUTER SUPPORT FACILITIES INFORMATION FORM

To be completed and submitted at project initiation and completion for each computer facility used. This form provides data on the quality and type of computer support facilities used by the project.

Parameter	Key	Format	E/A	Description
Date of Submittal	①	F-6		Current date, either the project initiation or completion date, in the format yymmdd.
Project Identifier	(2)	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Location of Facility	3	F-16	х	Check accessibility of the computing facility, equipment and personnel, to the individual user. Choices include: Dedicated - Equipment "owned" and operated by the project Central - Equipment immediately available but owned by the overall organization and shared with other projects. Teleprocessing - Equipment distantly located but available through a TSS or RJE network. Courier - Equipment distantly located and available
eng setakara Ana complete palak Coloryanakara sa Bilanyanakara salak Bilanyanakara		10 f 20 s		through courier service only. Travel -Equipment distantly located and accessed only by personal travel
Mode of Operation	4	F-16	X	Check the means of interaction with the computing device. Choices include: Batch - An individual computer job that is grouped with other jobs for processing. Batch-RJE - An individual computer job that is submitted to the computer by a remote job terminal, or other means of entry, but which is subsequently grouped with other jobs for processing.

P8-2 COMPUTER SUPPORT FACILITIES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Mode of Operation (cont'd)	1 200 0 1 97 9 0 1 90 9 0 5 90 1 21 90 1 21 90			Interactive - Simultaneous computer processing between individuals at terminals and the computing device. i.e., time sharing. Mixed - Both batch and interactive computer processing. Direct - User has complete control of the computing device in running his job.
Turnaround Time	5	F-3.1	X	The average time (hhmm) between the submittal of a job to the computing facility and its return to the requestor. (Omit when Interactive Mode-of-Operation is checked.)
Computer Availability	6	F-3.1	Х	The average number of hours per day the equipment is available for developmental use.
Quality of Equipment and/or Related Services		F-2	X	An evaluation of the quality of computing equipment and services rendered to the project, with respect to type of services offered, amount of down time of the equipment, etc. Rating scale is 1-10, where 1 = good, 10 = poor.
Quality of Operating System and Support Software	8	F-2	X	An evaluation of the software associated with the computing equipment with respect to the options offered, e.g., multiprogramming control services, data management capabilities, scheduling and dispatching options, languages supported, error recovery options, etc. Rating scale is 1-10, where l = reliable multi-capability support software, 10 = unreliable and/or limited capability support software.

P8-2 COMPUTER SUPPORT FACILITIES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Quality of Operating System and Support Software Documen- tation	9	F-2	X	An evaluation of the availability and clarity of the documentation supporting the use of the operating system, test and utility tools. Ratine scale is 1-10, where 1 = good, 10 = poor.
Device Identifier	10	F-24		The name of the computing device described, including the manufactures of the equipment, the series number, and the model number. (This field may be omitted if a single computer facility is used.)

P9-2 PROGRAMMING TECHNIQUES INFORMATION FORM

TECHNIQUE IDENTIFIER(S)	TECHNIQUE CLASS(ES)	TYPE C A M O	CO ACQUIRE	ST OPERATE	TRAINING EFFORT	INDEP.
(3)	4)	(b)	6	7	8	9

P9-2 PROGRAM METHODOLOGY INFORMATION FORM

To be completed and submitted at completion of the work definition phase and at completion of the software development project. This form provides information on the programming techniques that are both planned and actually used during the development process. All techniques, tools, concepts, etc., used by the project should be identified.

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either the completion of work definition or completion of the project, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Technique Identifier	3	F-20	Х	A short descriptive title of the technique.
Technique Class(es)	4	F-24	Х	Identification by class of the techniques used by project personnel in the process of developing the software. (Some techniques may belong to more than one class. In such cases, identify all classes) Classes include:
To not tecking a common to skew to the ske		ater m Tuen		Analysis - The class of techniques used in the analysis phase of software development. Example techniques of this class include modeling, simulation trade-off studies.
end processors, consideration of the consideration				Design - The class of techniques used in the design phase of software development. Example techniques of this class include top-down, modeling, proofs of correctness, informal design, bottom-up, hierarchical structure, modularity.
sty (gen a se				Implementation - The class of techniques used in the implementation phase of software development. Example techniques of this class include modularity, restricting control flow, programming standards, bottom-up, proofs of correctness, program production library.

Parameter	Key	Format	E/A	Description
Technique Class(es) (cont'd)	Eq Adag on office (Labelta)	18 25 7 18 2 7 18 31 7 18 31 7 18 31		Management - The class of techniques used in managing the software project directly supporting program production Example techniques of this class include chief programmer teams, configuration management, program production library, build approach.
To morthrogada path path to morthrogada order committees to project to a correction	Hadilo b to he cost so cost so trace b lie i	edalo di selence di dependi et di Lordal		Quality Assurance - The class of techniques used by the project to assure software quality. Example techniques of this class include static test tools, dynamic test tools, test teams, top-down testing, bottomup testing, program production libraries, formal design walk thru.
Thises and to are a mile are are are are are are are are are ar	To red a trespond trespond trespond trespond	And the second s	000 000 000 000 116	Notational Mechanisms - The class of mechanisms used in documenting the software and/or previously mentioned developmental techniques. Example techniques of this class include HIPO, programmer's notebook, decision tables, flowcharts.
Technique Type	(5	F-2	X	An indication of the degree of mechanism involved in the application of the technique to the work or product. Choices include:
BCCCCANO, 103280			90 S	Conceptual - Application of an idea to the development process.
2504 (Sept 1531) 2719000000 50 (Anal University				Manual - An established procedure, unaided by automatic means.
. goff 6.55 . hager a. . ngt 250 - famoure f . nagazina		7 28231 24 14 3 1 4 8831		Automatic - A computerized approach to aiding in the solution to the problem.
windser to your		7.15.119		mi <u>X</u> ed - Any of the above in combin- ation.
Acquisition Cost	(6)	F-8	Х	The cost in dollar resources of acquiring or developing the technique or tool, if applicable.
Operation Cost	(i)	F-8	Х	The cost, in dollar resources, involved in using the technique.

P9-2 PROGRAMMING METHODOLOGY INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Training Effort	8	F-4	X	An estimation of the average degree of educational effort required to become proficient in the use of the technique or tool, in man days effort.
Independence Rating	9	F-2	Х	The degree to which this technique stands alone; that is, can be used independently of a particular machine, operating system, language, application, or other constraint. Rating scale is 1-10, where 1 = independent, 10 = dependent.
				(a) : non-proposition engage (a) : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 100 : 1
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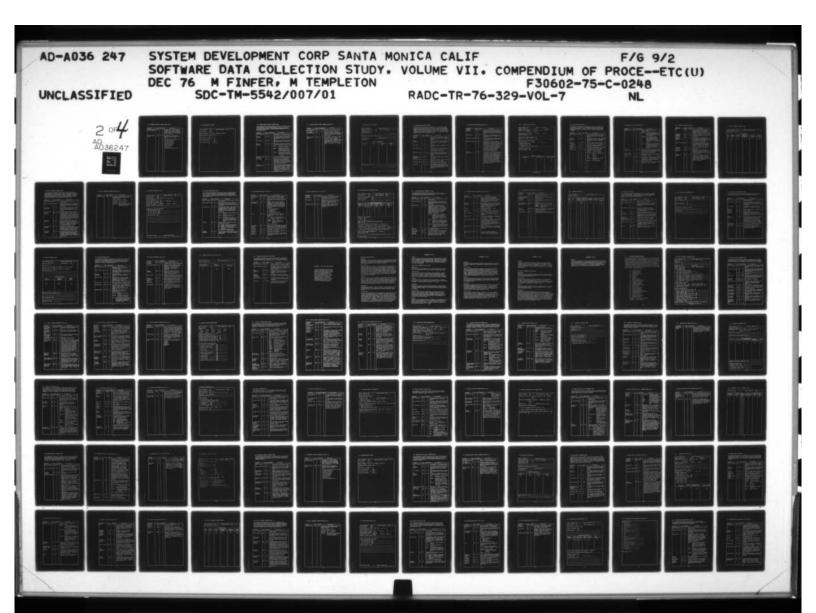
P10-2 PROGRAMMING LANGUAGE INFORMATION

DATE OF SUBMITTAL 1	PROJECT IDENTIFIE	R: (2)
SOURCE/OBJECT LANGUAGE IDENTIF	FIER: ③	
LANGUAGE COST DATA Language Acquisition Costs: Language Training Costs:	<u>4</u> <u>5</u>	
PROGRAMMING LANGUAGE EVALUATION Compiler/Assembler Reliabiling Language Documentation: Language Efficiency: Language Relevance to Project	ity: 6 7 8	
Test Data Generator	cy Checker 🗌	

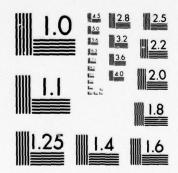
P10-2 PROGRAMMING LANGUAGE INFORMATION FORM

To be completed at project initiation and completion for each programming language used by project personnel. This form provides information on resources expended and capabilities provided in the use of the specific programming language.

Parameter	Key	Format	E/A	Description
Date of Submittal	(J.	F-6		Current date, either project initiation or completion in the format yymmdd.
Project Identifier	(2)	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Source/Object Language Identi- fier	(3)	F-12		Name or designator of the source or object language used, and for which all remaining parameters are associated.
Language Acqui- sition Costs	(4)	F-8	Х	The total resources expended in dollars for the acquisition and/or installation of the programming language, if applicable.
Language Training Costs	(5)	F-8	X	The total resources expended in dollars for the training of project personne! in the use of the programming language, if applicable.
Compiler/Assembler Reliability	(6)	F-2	Х	An evaluation of the degree of reliability in the use and operation of the language compiler and/or assembler. Rating scale is 1-10, where I = very reliable, 10 = unreliable.
Language Documentation	①	F-2	X	An evaluation of the accessability and understandability of the documentation supporting the specified programming language. Rating scale is 1-10, where 1 = good, 10 = poor.
Language Efficiency	(8)	F-2	X	An evaluation of the operational efficiency of the language within the operating milieu of the hardware/ software support systems. Rating scale is 1-10, where 1 = efficient, 10 = inefficient.



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P10-2 PROGRAMMING LANGUAGE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Language Relevance to Project Goals	9	F-2	X	An evaluation of the programming language in its support of project specific goal, such as programming standards and/or structured programming. Rating scale is 1-10, where 1 = high, 10 = low.
Language Support Tools	10	F-24	X	Check the tools or capabilities associated with the language and/or compiler. Choices include:
The work of a stand of the stan				Program Interface Consistency Analyzer Cross Reference Analyzer Program Instrumenter Test Control Monitor Debugging Interpreter Test Data Generator Test Data Reducer Macro Preprocessor Reformatter Standards Auditor Structured Programming Auditor
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P11-2 PROGRAM PRODUCTION LIBRARY

DATE OF SUBMITTAL:	004 18	PROJECT	IDENT	IFIER:	(2)
PPL IDENTIFIER: 3					
MODE OF OPERATION: 4 AUTO MANPOWER RESOURCE ALLOCATION:	(5)	MANUAL		MIXED	Tatt Library to other
SKILL LEVEL: 6	- (-		2.7	9	
COST OF ESTABLISHING PPL:	(1)				
PPL UTILIZATION COSTS:	8				
PPL EFFECTIVITY RATING:	9				
tion of computer utilization PPL operation. Choices inclu- Automatic processing, with an examunt a libraryan					
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P11-2 PROGRAM PRODUCTION LIBRARY INFORMATION FORM

To be completed and submitted at project initiation and completion when the project maintains or uses a Program Production Library, or its equivalent. This form provides information on the resources expended on the PPL development and maintenance. (This form should be submitted for each PPL used by the project.)

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initiation or completion, in the format yymmdd.
Project Identifier	@	F-8		An acronym, number or other identified that uniquely specifies the project and identifies all data collection forms.
PPL Identifier	3	F-8		An acronym, number or other identifier that uniquely specifies the project's PPL.
Mode of Operation	4	F-8	Х	Indication of computer utilization in the PPL operation. Choices include:
				AUTO - Automatic processing, with or without a librarian.
				MANUAL - Maintenance of programs, listings, and data is com- pletely manual, with or without a program librarian.
	ζ,			MIXED - Both manual and automatic means are used to maintain the library, with or without a librarian.
Manpower Resource	(5)	F-8	X	The amount of manpower allocated in man-months for the operation of the PPL.
Skill Level	6	F-2	X	The skill level of the personnel responsible for the operation and maintenance of the PPL, or the average skill level of the group of people contributing to the operation of the PPL. (See Attachment 1.)
Cost of Establishing PPL	1	F-8	X	Total resources in dollars expended for establishing the devices needed to support the PPL concept. (The dollar amount should indicate all software, documentation, and personnel training involved in developing the PPL and related tools. It should not include maintenance costs.)

P11-2 PROGRAM PRODUCTION LIBRARY INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description	
PPL Operation and Maintenance Cost	8	F-8	X	The total dollars spent to maintain the PPL, excluding computer costs.	
PPL Computer Utilization Costs	9	F-8	X	The cost of computer resources, including CPU time and storage, for support software directly maintaining the PPL as automatically calculated the software.	
PPL Effectivity Rating	10	F-2	X	the software.	

W1-2 WORK DEFINITION INFORMATION

WORK LEVEL: (3) Prowork IDENTIFIER: (4) WORK DESCRIPTION:	oject Phase	PROJECT IDENTIFIE Task Acti	ER:(2)ivity []			
IDENTIFIERS OF REF	PORTING WORK ELE	MENTS:				
INITIATION DATE: (7) COMPLETION DATE: (8) TERMINATOR: (9)						
bes profession	RESOURCE UTIL	IZATION DATA				
RESOURCE ID	UNIT	ALLOCATED	EXPENDED			
19)	0	(12)	(3)			
PRODUCT IDENTIFIERS: (14)						

W1-2 WORK DEFINITION INFORMATION FORM

The Work Definition Information Form provides data on the work breakdown structure in an hierarchical manner, showing the relationship of all work elements and the chain of authority for each work element the software development project has defined. The form is to be completed and submitted at project initiation, work plan formation, or when the work package allocation is changed. A Work Definition Information Form is to be completed for each element for which resource allocation is made.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date, either project initiation, work plan formation or change in work plan definition, in the format yymmdd.
Project Identifier	(2)	F-8	An acronym, number of other identifier that uniquely specifies the project, and identifies all data collection forms.
Work Level	(3)	F-8	Indication of the work breakdown level. Choices are project, phase task, activity.
Work Identifier	4	F-8	A name or number uniquely identifying this particular work element, and for which manpower, computer, etc., resources will be allocated.
Work Description	(5)	V-256	A brief narrative description of the work to be performed including the purpose, scope and method for this element.
Identifiers of Reporting Work Elements	6	F-8	Identification of all of the elements into which this work element is subdivided.
Initiation Date	(7)	F-6	The calendar date for starting the work element, in the form yymmdd.
Completion Date	(8)	F-6	The calendar date for completing the work element, in the form yymmdd.
Terminator	9)	F-12	The action taken that completes the work element being defined. This may be a milestone, identified on the W8 form, an informal review, or a delivery.

W1-2 WORK DEFINITION INFORMATION FORM (cont'd)

Parameter	Key	Format	Description
Resource Identifier	@	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type travel type, computer time, storage, etc.
Resource Unit	(1)	F-10	The basic unit of expenditure of the resource, as manhours, mandays, hours, minutes, etc.
Resource Allocated	(12)	F-8	The total amount of the resource unit allocated or budgeted for the total work element.
Resource Expended	(13)	F-8	The amount of allocated resource expended to the reporting date for this work element. (Generally, this field is blank since the form is submitted at initiation of the work element, prior to resource expenditures. However, in the event that resources have been expended, include all expenditures for this work element to date.) Calculated from monthly status reports after initial input.
Product Identifier(s)		F-12	The unique identifier of the specific product, or service, whose production is evaluated. (The combination of characters uniquely identifying the work element and associated products together form the key by which all products within all work elements can be identified. Resource expenditures and productivity data are periodically collected via these identifiers.) All products identified must be described on the W2 Product Identification Form.

W2-2 PRODUCT IDENTIFICATION FORM

DATE OF SUBMITTAL:	PROJECT IDENTIFIER	:(2)						
PRODUCT IDENTIFER: (3)MOD								
PRODUCT TYPE: 6 Document Progr								
Service Other	• []							
REPORTING LEVEL: 7 System Su	REPORTING LEVEL: 7 System Subsystem Module							
PRODUCT DESCRIPTION: (8)								
IDENTIFIERS OF PRODUCT COMPONENTS: (IDENTIFIERS OF PRODUCT COMPONENTS: 9							
PRODUCTION DATA RELATED TO PRODUCT								
Work Unit. (10) Size: (11)	COST: (12	2)						
PROGRAMMING LANGUAGE DATA								
Language Identifier: (13)								
Language Efficiency for Product: $(1$	4)							
PRODUCT EVALUATION RATING								
Product Complexity: (15)								
PROGRAMMING	TECHNIQUES USED							
TECHNIQUE ID	RELEVANCE RATING	INTEGRATION RATING						
		\sim						
(16)	(17)	(18)						

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W2-2 PRODUCT IDENTIFICATION FORM

To be completed and submitted at completion of the work or product definition phase and at completion of the software development project for each product being developed. This form provides information identifying each configuration item, its hierarchical structure, complexity, and resources allocated.

Parameter	Key	Format E	/A	Description
Date of Submittal	①	F-6		Current date, either project initia- tion, work plan formation or change in work plan definition, in the format
on one for the co	011217	105		yymmdd.
Project Identifier	(2)	F-8		An acryonym, number or other identifie that uniquely specifies the project and identifies all data collection forms.
Product Identifier	.3	F-8		A name or number uniquely identifying the configuration item or product.
Product Mod Number	(4)	F-2		Modification number, reflecting the sequence of product evolution.
Product Version Number	(5)	F-2		The model or build numbers, reflecting the sequence of product releases.
Product Type	(6)	F-12		The general class of the product described. Choices include:
	101516	not seed a		Document - All written material.
	23 AQ 983 3	Bayerton r. Etnomoy	1	Program - Systems, subsystems, pro- grams.
	11	garante de	1	Data - Data base
	(BD)	(n 310)		Test - Test case
		omerana a a La canta a u		Services - Data processing related services.
		128 27 27 1 1 2 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1	Other - None of the above.
		Service Austral		

W2-2 PRODUCT IDENTIFICATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Reporting Level	0	F-9		Level of software configuration. Choices include:
	ingsell Fre .e	ab, lmm		Module - A software entity that is discrete and identifiable with respect to designing, compiling and loading.
r on other teams: The acher teams as the control of the control o	idents Pena yf Ta car	nein e Pige Senon de Edensie Edensie	1000 1000 1000 1001 1001 1001	Subsystem - A subordinate system, consisting of one or more interacting modules (It is usually capable of operating independently of, or synchronously with, a controlling system.)
	notana notana notana produc produc notana	ase or gonfig chocked come o sodel sequen	ontil ontil ontil ontil	System - An organized set of software modules and/or subsystems, data base elements, and user prodcedures created to perform a set of specific functions.
Product Description	8)	V-256		A short narrative description of the configuration item or product including the objective, function, general composition and/or operation.
Identifiers of Product Components	(9)	F-8	Х	Identification by identifier of all components of the next lower hierarchy of products, if any.
Work Unit	100	F-10		The unit by which work productivity on this product is measured, e.g., lines of source or object code, pages of documentation, records of data, manhours of work service.
Size	(1)	F-8	X	The number of Work Units required to produce the specified product.

W2-2 PRODUCT IDENTIFICATION (cont'd)

Key	Format	E/A	Description
12	F-8	X	The value of the resources expended in the production of the product. (If more than one type of resource is expended, resource values should be reduced to common base such as dollars.
13	F-12	X	The name or designator for the language in which the product is written, if applicable.
14	F-2	X	An evaluation of the operational efficiency of the language, considering the hardware/software support systems. (Rating scale is 1-10, where 1 = efficient, 10 = inefficient.)
15)	F-2	X	An estimate of the complexity level of the product based on the number of product interfaces and/or processing decisions. (Rating scale is 1-10, where 1 = easy, 10 = most difficult.)
16)	F-20	X	A short descriptive title of the technique.
17	F-2	Х	An overall rating of the specific applicability of the technique to the application problem solved. Rating scale is 1-10, where 1 = most relevant, 10 = irrelevant.
18	F-2	X	A rating of the degree to which this technique is integrated with, or supports, other tools and techniques, as a compiler might enforce programming standards. Rating scale is 1-10, where I = well integrated, 10 = poorly integrated.
	(13) (14) (15) (16) (17)	13 F-12 14 F-2 15 F-2 16 F-20 17 F-2	12 F-8 X 13 F-12 X 14 F-2 X 15 F-2 X 17 F-2 X

W3-2 PROJECT PERFORMANCE INFORMATION FORM

		PR	ODUCTION DATA		Lorento Consol
WORK ID	PRODUCT	RESOURCE ID	RESOURCE UNITS EXPENDED	WORK UNITS PRODUCED	PRODUCT STATUS
4	(5)	6	7	(8)	9
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		Be and to cut and as supt	26 A 34 08 53		Properties offered
	10 000005 10 0000013 0	ng gawas I tan Sanahas I	26		
	LISTERS	(2) (1) (1) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	in ou		

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W3-2 PROJECT PERFORMANCE INFORMATION FORM

To be completed and submitted at the end of each reporting period (A reporting period of no greater than one month is recommended.) The information reported must indicate the work progress and resource expenditures for the reporting period, and should not reflect information reported in a previous reporting period. This form provides information on resource expenditures, productivity data, and work and product status.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	2)	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Organization Identifier	3	F-8	A short acronym or number that uniquely defines the organizational unit, and for which resource data may be accumumulated.
Work Identifier Product Identifier	45	F-8 } F-8 }	The combination of the work and product identifiers together form a unique acronym, number or name by which total expenditures for the product and/or work element and/or organizational unit may be accumulated. All work elements and/or products for which progress was made, or resources expended, during the reporting period must be listed.
Resource Identifier	(6)	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type, travel type, computer time, storage, etc. All resources expended during the reporting period must be listed.
Resource Units Expended	(T)	F-10	The number of resource units (e.g., computer time, manpower) spent during the reporting period. (The unit of measure has previously been identified on the WI form, and need not be specified.)
Work Units Produced	(8)	F-10	The amount of work units (e.g., lines of source code, pages of documentation) produced during the reporting period. (The unit of measure has previously been identified on the W2 form, and need not be specified.)

W3-2 PROJECT PERFORMANCE INFORMATION FORM (cont'd)

Parameter	Key	Format	Description
Product Status	9	F-10	The level of work accomplished for the product during the reporting period. Choices include:
10 8			Started - Work was initiated
to ar choraca parti		step tos	Continuing - Work is continuing
			Completed - Work is completed
mann Contilian A project and Olimita form to			Milestone - Indication that the milestone for this work element was successfully passed.
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W4-2 SOFTWARE PROBLEM REPORT (SPR)

DATE OF SUBMITTAL: PROJECT IDENTIFIER: SPR IDENTIFIER: 3
SPR TYPE: 4 FR DC MC EF ED EC EMPLOYEE IDENTIFIER: 5
DATE OF PROBLEM DISCOVERY: 6 TIME OF DAY: 7 WORK IDENTIFIER IN PROGRESS: 8
STATUS: 9 OPEN CLOSED PENDING OTHER PRODUCTS IMPACTED BY PROBLEM: 10
PRODUCTS USED WHEN PROBLEM OCCURRED:
Data Base Identifier: (11)
Test Case Identifier: (12)
Test Tool Identifier: (13)
PROBLEM DESCRIPTION: (4)
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DATE RECEIVED: 15 EMPLOYEE ASSIGNED: 16

W4-2 SOFTWARE PROBLEM REPORT (SPR)

To be completed and submitted to the project office by project personnel when a problem is discovered in the software or other associated product items. The SPR is submitted to the RADC repository at the established reporting period. This form provides information on discrepancies found in any configuration item.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
SPR Identifier	3	F-8	A unique number, name or other identifier assigned by the project configuration management office or project office. Assigned to SPR's in sequence; current military practices use the following conventions:
			ECPxxx - Engineering Change Proposal for changes.
			SPRxxx - Software Problem Report for corrections.
			DRFxxx - Discrepancy Report Form for corrections (If the SPR or DRF results in a requirements or design change, an ECP is generated.)
SPR Type	4	F-2	The general class of problem involved. Sample choices include:
			FR - Changes in functional requirements DC - Changes in designed configuration MC - Changes to a finished product EF - Errors in a functional analysis or requirement ED - Errors in a proposed design EC - Errors in a finished product
Employee Identifier	(5)	F-8	A name or number uniquely identifying the project member. (To be used by project office only).
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W4-2 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Date of Problem Discovery	6	F-6	Date the problem is discovered by the project employee, in the form yymmdd.
Time	1	F-4	Exact time of day on the above date that the problem was discovered, in the form hhmm.
Work Identifier in Progress	8	F-8	Identification of the work element in progress during which the problem was discovered. In the event that separate testing periods were not identified as activities on the WI - Work Definition Form, the following test periods are suggested:
		L	U - Unit (or module) test I - Integration test S - System test A - Acceptance test O - Site or installation test
Status	9	F-8	Indication of the action taken by the project manager's office. Choices include:
			OPEN - Problem is being studied to determine the appropriate action.
			CLOSED - Problem is fixed.
	1		PENDING - Problem is deferred, not reproducible, or of low priority.
			OTHER - Explain below.
Product(s) Impacted by Problem	10	F-8	<pre>Id(s) of the product elements that appear to be involved in the problem (Include mod and version number where appropriate.)</pre>
Data Base Identifier	(1)	F-8	Id of data base used when problem was discovered, if applicable.
Test Case Identifier	12	F-8	Id of test case used which demonstrated the error, if applicable.
Test Tool Identifier	13	F-8	Id of test tool, driver or other program used which demonstrated the error, if applicable.

W4-2 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Problem Description	(14)	V-256	Description of the problem, including the symptoms, and possible impact on other product or work elements.
Date Received	15)	F-6	Date the SPR was received by project manager's office and assigned to project personnel for appropriate action, in the format yymmdd, if applicable.
Employee Assigned	6	F-8	A name or number uniquely identifying the project member responsible for correction. (To be used by project office only.)
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	i Cale di Partiti per	e / Jes	Test Tool - 18 18 18 18 18 18 18 18 18 18 18 18 18

W5-2 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

DATE OF SUB SMT IDENTIF TIME OF DAY EMPLOYEE ID SPR(s) RESO	IER: OF CORF			THE PROPERTY OF THE PARTY OF TH	IDENTIFIER: CORRECTION:	<u>2</u> <u>4</u>
	Halle			ODIFICATIO		
PRODUCT IDENTIFIER	OL D MOD	NEW MOD	UNIT OF CHANGE	AMOUNT CHANGE	DIFFICULTY RATING	WORK IDENTIFIER
8	9	100	1	12	13	14
Design [] Data Handl User []	15 — 16 — TIER IN 18 Doc ling Routine	PROGRE rator umenta Logi /Routi Requ	SS WHEN ERR	equests [] I/O [] G outine/Syste [] O-S ompliance [Computation lobal Data De tem Interface S/System Suppo Tape Prod Abnormal	finition [
DATE RECEIVE	D: (21)_					

W5-2 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

To be completed and submitted to the project office upon successful software modification by the responsible employee. The SMT is submitted to the repository at the established reporting period.

Key	Format	Description
①	F-6	Current date of reporting period, in the format yymmdd.
(2)	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
(3)	F-8	An alphanumeric identifier uniquely identifying a change or package of changes to a product. (The identifier is normally composed of a set of initials identifying the type of change package and a number indicating the sequential number of the change.) Existing military practices adhere to the following conventions:
		VDDXXX - A Version Description Document accompanying a new model or release of a system specifying which changes have been incorporated to which models of the system.
(f)) CETARON	SCNXXX - A Specification Change Notice accompanying a package of change pages to a design specification, test plan or other document.
		CRXXX - A Change Report covering a series of Class II (non-cost, non-impact) changes that have been made to the system.
4	F-6	The calendar date the error was corrected, in the format yymmdd.
5	F-4	The time of day on the above date the error was corrected, in the format hh:mm.
6	F-8	The name or number of the employees responsible for modification. (To be
	① ② ③ ④ ⑤	① F-6 ② F-8 ③ F-8 ⑤ F-4

W5-2 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

Parameter	Key	Format	Description
SPR's Resolved	7	F-8	A list of Software Problem Report Identifiers that this modification package resolves, or partially resolves. (If the SPR is partially resolved, a P should be appended to the SPR number, e.g., CR123P.)
Product Identifier	(8)	F-8	The name(s) of the product items containing or impacted by the error. When the error is found to be in more than one product, list all products, e.g., documents, data base.
01d Mod	9)	F-2	Modification number of the product containing the error.
New Mod	10	F-2	New modifiction number assigned to the product being altered, if applicable.
Unit of Change	Û	F-10	The unit used to measure the size of a change, as lines of code, or pages of documents.
Amount Change	12)	F-8	The volume and direction of change as a result of the modification, + = addition, - = deletion, / = change.
Difficulty Rating	13/	F-2	An evaluation of the degree of difficulty in implementing the change. Rating scale is 1-10, where l = easy, 10 = extremely difficult. (The difficulty rating should be estimated with regard to the impact the error had on the specific product.)
Work Identifier	14)	F-8	Name of the work element in progress for the specific product when the correction was made.
Manpower Resource Data	15	F-4	Indicate in mandays the amount of resource needed to correct the error and install the software modification.

W5-2 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

Parameter	Key	Format	Description
CPU Time	16)	F-4	The exact amount of CPU time in minutes used to correct the error.
Work Identifier in Progress when Error Generated	17)	F-8	Identify as near as possible the work element in progress in which the error was generated.
Error Type	18)	F-28	Identify the error type within the given error categories that best fit this error.
Type of Software Termination	19	F-8	Indicate how the software terminated processing when the error occurred.
be it yaw. Man nie nijakis e g . ni	01 00 1 1 1 1	ick at no fil Stabil Laterial	NORMAL - Normal processor termination ABNORMAL - Abnormal processor termination.
Error Description	20	V-256	Description of the error, including the accuracy of the error description on the associated SPR(s).
Date Received	21)	F-6	Date the project manager's office received the SMT, in the format yynmdd.
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W6-2 SOFTWARE OPERATIONS LOG

LOG	JOB	COM	PUTER	J0B	ACCE	PTANCE	COMPUTER	COMPLETION	CPU TIM
DATE	ID	MO	DATE	HR	TIME	SEC	- OPERATIONS	CODE	MIN SEC
(4)	(5)			6			(1)	(8)	9
			MAGA LO E DE LO E DE L						
			30u i					901 2001 J. (400 9003	onna 190 Green ope
						A ST			500 7 (0)

W6-2 SOFTWARE OPERATION LOG

To be completed and submitted by the project librarian, or data collection clerk, in the event that a software monitor does not automatically collect computer run information. The data should be submitted to the RADC Repository at the established reporting period.

Parameter ;	Key	Format	Description
Date of Submittal	1	F-6	The current date of the reporting period, in the form yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.
Log Date	4	F-6	The current calendar date of the computer operations, in the form yymmdd.
Job Identifier	(5)	F-8	A unique number or other identifier that uniquely specifies the components of the computer job. (Specified on a W7 Form.)
Computer Job Acceptance Time	6	F-10	The date and time of day the job was accepted by the computer, mmddhhmmss.
Computer Operations	1	F-24	A list of each job step or type of computer operations performed in this job
Completion Code	8	F-4	The status indicator for the job step or computer operation in the job. (Completion code identification may be input by the D1 form.)
CPU Time	9	F-6	The total time used by each job step or operation in this job, mmss.

W7-2 JOB IDENTIFICATION INFORMATION FORM

DATE OF SUBMITTAL: ① JOB IDENTIFIER: ③	PROJECT IDENTIFIER: EMPLOYEE IDENTIFIER:	<u>4</u> <u>5</u>
TEST CASE IDENTIFIER: (5)	esal all	selfa mehi pastors
PRODUCT IDENTIFIER(S): 6		
TECHNIQUE/TOOL IDENTIFIER(S):		
DESCRIPTION: (8)		

W7-2 JOB IDENTIFICATION INFORMATION FORM

To be completed and submitted by project personnel upon completion of test case definition or change to a previously identified job definition.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Date of test case definition or change in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Job Identifier	3	F-8	A unique name or number identifying the components of this specific computer run.
Employee Identifier	4	F-8	A name or number uniquely identifying the project member.
Test Case Identifier	(5)	F-8	A short name or number uniquely identifying the test case used in the computer job. (This test case may or may not have been identified as a product on a W2 Form.)
Product Identifier(s)	<u>(6)</u>	F-8	The name or number uniquely identifying the configuration item(s) being tested by the specified test case for the computer job. (In the event that a configuration item is specified that consists of many sub-items, the highest level identifier should be specified.)
Technique/Tool Identifier(s)	1	F-20	The title of the technique or tool used for the computer job, if applicable.
Description	(<u>®</u>)	V-256	A brief narrative describing the objective of the computer run utilizing the specified components.

W8-2 MILESTONE INFORMATION FORM

DATE OF SUBMITTAL: 1	PROJECT	IDENTIFIER: ②
MILESTONE IDENTIFIER: 3	WORK IDE	NTIFIER: 4
DATE OF EVENT: (5)	TW3 1644	
MILESTONE TYPE: 6 REVIEW	DELIVERY T	TEST OTHER
MILESTONE STATUS: 7 PENDI	NG COMPLETE	OPEN
MILESTONE DESCRIPTION: 8 _		
Li sondi aestre (ul esibi i fi Lion		
massaila artijeas e	Jaz Tenereab	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	MILESTONE SUB-EVENTS	11 75x I ser (year) e
WORK IDENTIFIER	PRODUCT IDENTIFIER	PRODUCT STATUS
h tongin max simila s di		
9	10	(1)
		Tools surge same
PRODUCT IDENTIFIER(S) BASELI	NED: 12	
SPR(s) ESTABLISHED: 13	gert en 4 mars i	
AUTHENTICATION: 14	1000	

W8-2 MILESTONE INFORMATION FORM

To be completed and submitted at completion of the work definition phase and at completion of the milestone event for each milestone in the software project. This form provides information on the product and/or work status, criteria for successful completion of the milestone, and error reports generated as a result of the milestone event.

Parameter	Key	Format	E/A	Description
Date of Submittal	①	F-6	X	Date of project initiation or completion of the milestone event, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms
Milestone Identifier	3	F-8		for the project. A unique alphabetic or numeric name designating a specific milestone event.
Work Identifier	4)	F-8		Identification of the work element whose successful completion is to be evaluated. (This field may be omitted if the milestone is not associated with a single work element.
Date of Event	(5)	F-6	X	The date, scheduled or actual, of the milestone event, in the format yymmdd.
Milestone Type	6	F-16		The general class of event taken as an index of project progress and product quality. Choices include product review, product delivery, performance test, other (described
Milestone Status	1	F-8		in & . Checks the current status of processing of a milestone event. Choices include:
				Pending - Milestone event has been scheduled.
40.00				Complete - Milestone event has been successfully completed.
				Open - Milestone event has occurred and revisions, errors, or other modifications to product or work elements are required for successful closure.

W8-2 MILESTONE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Milestone Description	8	V-256		A narrative description of the milestone event, including the purpose
Work Identifier(s)	9	F-8	Х	Specify the work element to be completed as a criteria for milestone acceptance. (This field may be omitted when the work element identified in 4 applies to all products.)
Product Identifier	10	F-8	Х	Specify the highest-level product identifier for the work element specified that is to be evaluated during the milestone event.
Product Status	11)	F-20	X	Indicate the status that the specified product is to hold at the time of the milestone event: complete, pending, etc.
Product Identifier(s) Baselined	12	F-8	Х	Specify the Product Identifiers that were approved or baselined during the milestone event, if applicable.
SPR(s) Established	(13)	F-8		A list of Software Problem Reports (SPR) Identifiers written as a result of the milestone event.
Authentication	14	V-100		A reference to the vehicle used to indicate the formal acceptance of the product or service (including the countersigning of a specification or other product.)

D1-2 COMPUTER OPERATIONS IDENTIFICATION FORM

DATE OF SUBMITTAL: 1 DEVICE IDENTIFIER: 3	PRO	PROJECT IDENTIFIER: ②				
COMPUTER OPERATIONS IDENTIFIERS	COMPLETION CODE	3.4	DESCRIPTION			
(4)	(5)			6		
description of the description o						
No. 1586 to the checkfield the State of the		17-20				
Product (densifiers the parton densing with w besettment across se event, the applicable						
description Problem (control of the control of the						
or begin of them after of season to the season of the seas		001-14				
- Se range difference a region						

D1-2 COMPUTER OPERATIONS IDENTIFICATION FORM

To be completed and submitted by the project librarian or equivalent prior to computer usage by project personnel. This form defines the computer operations and associated completion codes for each computing device used.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Prior to completion of the W6 - Software Operations Log, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer, the series number, and the model number.
Computer Operations Identifiers	4	F-12	The name of the computer operations available for use by project personnel.
Completion Codes	(5)	F-4	The alpha or numeric completion code associated with the specified computer operations.
Description	6	V-256	A description of the meaning of the specified completion code for the specified computer operation.

ATTACHMENT 1 - SKILL LEVEL CLASSIFICATION

The skill level positions herein defined represent eight typical data processing positions, two non-exempt and six exempt, two of which include management roles. Due to the wide range of positions found in the software industry, these positions have been chosen as a subset of the entire set. The objective of defining skill levels as a separate attachment allows for flexibility in these definitions, as well as allowing for expansion or contraction of skill levels as the need becomes apparent.

DEFINITION OF NON-EXEMPT JOBS:

POSITION 1:

Performs basic clerical assignments required in the data processing cycle such as assisting in the updating of data processing source reference files, translating verbal or graphic data into codes, and/or assisting in reviewing data processing documents before and after machine production.

Typical Duties:

Maintains updated data processing source reference files, as directed, by performing such duties as assembling, sorting and reducing pertinent data in accordance with established data processing procedures. Also, prepares graphic or tabular statistical presentations and summaries. Translates verbal, graphic, and other data into standard machine acceptable codes. Assists in the review of various data processing documents before and after machine processing as well as the punched card and other reference files for the purpose of eliminating clerical or system errors. Reviews items such as code identification, legibility, completeness, continuity, and conformance to establish data processing specifications.

Comments:

Requires the ability to operate typewriter, adding machine, calculator, key-punch, or similar machines. Requires the ability to maintain a very high degree of accuracy and legibility in code and symbol manipulation. Requires the ability to apply a very broad variety of arbitrary codes and translate into compatible machine codes. Requires the ability to perform detailed work accurately, and to reduce voluminous material into useful data. Requires the ability to effectively document, disseminate, and correlate technical data.

POSITION II:

Performs program production library assignments, including gathering, filing, and distributing technical documents and other data, maintaining computer programs pertinent to library operations, and producing automated library catalogs.

Typical Duties:

Performs tasks associated with library operations to include procuring, indexing and filing pertinent documents, coding data for producing the library catalog, preparing special and source listings, and storing, handling, and regulating the flow of documents among users. Coordinates with users to collect program decks, listings, magnetic tapes, paper tapes, and documentation for the library; incorporates these materials into the library's computer based catalog system. Reviews users's submittals to the library to verify accuracy and confit in accordance with computer system specifications and restrictions; ac ts or rejects submittals to the library on the basis of this review, and coordinates with the submitter to resolve problems.

Comments:

Normally requires at least one year experience in data processing. Requires a general knowledge of project activities and a knowledge of library operations, cataloging, users' documentation systems, and the ability to interact and coordinate with internal and external users. May require the ability to use the following equipment: computer terminal and peripheral equipment, calculator, and typewriter.

DEFINITION OF PROGRAMMER POSITION LEVELS:

POSITION III:

Develops fundamental programming skills by receiving instructions in basic principles and techniques of EDP, most frequently through on-job training.

Typical Duties:

Prepares detailed flow charts from general program statements; translates flow charts into assembly or compiler languages; develops test data and routines which he applies to checking out his program; documents the procedures used in standard terminology. Requires direct constant supervision, with particular emphasis on technical training and professional development.

Comments:

Includes persons who have completed initial orientation with introductory training courses as well as those who are beginning to perform as professional programmers. Average programming experience: 1-1.5 years.

POSITION IV:

Performs all functions of digital computer programming. Continues extensive development of programming skills and techniques through greater variety of work assignments, broader level of responsibility, and increased complexity of assignment.

Typical duties:

Reviews and interprets basic systems designs and specifications; creates general, as well as detailed, complex flow charts; translates complex flow charts into assembly or compiler languages; develops test data and routines required for program checkout; documents all procedures utilized by the program. Requires direct supervision with continuing emphasis on technical training and development.

Comments:

Performs as the journeyman applications programmer, handling modification and adaption of existing programs, as well as writing new programs that utilize standard procedures and techniques. Frequently assigned to activities such as payroll, inventory control, engineering statistics, personnel, etc. Average programming experience: 3-4 years.

POSITION V:

Concentrates general programming experience into specialized skills area such as: design, formulation, or implementation of complex computer programs and systems.

Typical duties:

Establishes program system elements needed to achieve specific objectives sought by each organizational unit concerned; reviews hardware capabilities and new technological changes; determines cost and quality choices as a basis for measuring the feasibility of various programming system approaches; submits, for management approval, proposals for new or revised programming systems; formulates design specifications to meet the objectives of new or revised systems; writes general and/or detailed flow charts for major new or revised complex programming systems. Requires general supervision.

Comments:

Depth experience provides the basis for specialization; permits the programmer to build efficiencies and economies into the complete computer operation. For most computer user installations this would represent the highest level of programming required.

POSITION VI:

Researches "first-time" approaches and techniques for application to original or established computer programming systems, utilizing advanced knowledge of scientific, mathematical, or economic disciplines and an expanding understanding of computer methodology and technology. Commands the ability to exercise advanced creativity and inventiveness in the development and design of original, major computer programming systems.

Typical duties:

Specifies general programming design concepts for "first-time" programming systems; conducts research in automation techniques which significantly extends the state of the art; recommends new or revised hardware capabilities which result in significant changes to general programming activities; acts as senior programming systems consultant in advanced computer system technology; consults with computer design engineers in the development of original hardware systems. Requires minimum supervision.

Comments:

Frequently, an "individual contributor" functioning at a level equal to, or above, the typical first level of data processing management. Works at the highest level of creativity and originality. This activity is rarely found in computer installations of commercial organizations. In total, the population of POSITION V probably does not exceed 5 percent of the programming profession.

DEFINITION OF MANAGEMENT POSITION LEVELS

POSITION VII:

Organizes and directs a technical aspect of a project or program concerned with the design, development, and implementation of existing and/or proposed operational and/or support systems.

Typical duties:

Responsible for the technical direction of project or program activities, but may not be required to supervise others permanently and administratively. Directs project/program by planning, organizing, and coordinating the development and implementation of new or ongoing technical activities; assigns specific work objectives; may supervise others.

Comments:

Usually in charge of a specific functional or operational area, or a section of the total project, especially in large programming projects. Average experience exceeds eight years.

POSITION VIII:

Responsible for supervising and providing over-all technical guidance to a project or program staff concerned with the design and/or development, integration, and implementation of existing and/or proposed operational and/or support systems; may participate in technical and administrative planning for his corporate organization, and may represent his Division/Department Manager as a corporate spokesman in matters relative to project or program commitments. Organizes, establishes the objectives for, and defines the over-all work efforts of the project/program staff; insures that on-going activities conform with predetermined objectives and/or contractual requirements and complement the functions of departmental branches.

Comments:

This level of management will have at least one Position VII on their staff, and will normally be more experienced than Position VII. Also, this position requires the capability of providing frequent and effective technical direction on the most complex activities. Generally, managers will become highly involved in the development of new concepts and interdisciplinary technological applications covering a wide scope of operations.

2.3 DATA COLLECTION FORMS - GROUP 3

The following data collection forms comprise Group 3 for collecting a large volume of data parameters. These data support the same studies as Group 1, and Group 2, but include numerous data parameters pertaining to a wider range of topics important to the software development process as discussed in Volume 003 of the Data Collection Study. Many of the forms and associated instructions are identical to Group 2 but are presented as an entire set in order to clarify the alternatives existing within the data collection system. Group 3 consists of the following forms:

- Pl Project Environment
- P2 Contract/Customer
- P3 Software Installation
- P4 Subcontractor
- P5 Organization
- P6 Employee
- P7 Computer Equipment
- P8 Computer Support Facilities
- P9 Programming Techniques
- P10 Programming Language
- Pll Program Production Library
- Wl Work Definition
- W2 Product Identification
- W3 Project Performance
- W4 Software Problem Report
- W5 Software Modification Transmittal
- W6 Software Operations Log
- W7 Job Identification
- W8 Milestone Identification
- D1 Computer Operations
- Attachment 1 Skill Level Classification
- Attachment 2 Error Categories

P1-3 PROJECT ENVIRONMENT INFORMATION FORM

DATE OF SUBMITTAL: 1	PROJECT IDENTIFIER: 2
TITLE: 3	
DESCRIPTION: 4	
START DATE: (5)	END DATE: 6
CONTROL AUTHORITY: 7	NUMBER OF CONTRACTORS: 8
PROJECT SIZE ESTIMATES	
Total Manpower: 9	
Total Pages Documentation: 10_	
Total Number Program Modules: (<u> </u>
Total Number Subsystems: (12)	
Total Number Source Statements	in Operational Software: (13)
Total Number Source Statements	in Support Software: (14)
Total Number Object Statements	in Operational Software: (15)
Total Number Object Statements	in Support Software: (6)
Total Number Bytes in Data Base	: 17
PROJECT COMPLEXITY ESTIMATES	
Overall Project: (18)	Application Software: (19)
Control/Operating System: (20)	Support System/Tools/Aids: (21)
Data Base Structure: (22)	
PROJECT EVALUATION RATINGS	The state of the s
Quality of Requirements Specific	cations: 23
Quality of Design Specification	
Schedule Adequacy: (25)	
Overall Project Management Effe	ctiveness: (26)
Overall Project Personnel Quali	
Computer Resources Adequacy: (28)	
Quality of Customer Supplied In	
Timeliness of Review Actions: (
Funding Adequacy: (31)	
PROJECT SOFTWARE TYPE: 32 BUSIN	NESS SCIENTIFIC SYSTEMS
	TENANCE OTHER

P1-3 PROJECT ATTRIBUTES INFORMATION FORM

To be completed and submitted at initiation and completion of the software development project. This form defines the reporting project, the project size, software complexity, and adequacy of other project specific parameters.

Parameter	Key	Format	E/A	Description	
Date of Submittal	1	F-6	103 103	Current date, either project initiation or completion date, in the format yymmdd.	
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.	
Title	3	F-16		A short name or descriptive title for the project.	
Description	4	V-256		A brief narrative description of the software development project, covering its objectives, scope and approach.	
Start Date	(5)	F-6		Date project is initiated.	
End Date	(5) (6) (7)	F-6	X	Date project is to terminate.	
Control Authority	7	F-10	GA.	The name or phrase characterizing the customer's configuration control agency, e.g., SPO, CCB, project monitor, etc.	
Number of Sub- contractors	8	F-4	X	Total number of subcontractors participating in software development project.	
Total Manpower	9	F-8	X	The number of man years required for the software project.	
Total Pages of Documentation	0	F-8	X	The total number pages of documentation to be produced during the performance of the project.	
Total Number Program Modules	0	F-8	X	The total number of modules to be produced during the performance of t project.	
Total Number Subsystems	13	F-8	X		
Total Number Operational Source State- ments	(3)	F-8	X		

P1-3 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description	
Total Number Support Source Statements	14	F-8	X	The number of deliverable POL state ments in the support software.	
Total Number Operational Object Instruc- tions	15)	F-8	X	The number of deliverable MOL state- ments in the operational system.	
Total Number Support Object Instructions	16)	F-8	X	The number deliverable MOL statements in the support software.	
Total Number Bytes in Data Base	17	F-8	X	The number of bytes of storage required for data storage.	
Overall Project Complexity	18	F-2	X	An evaluation of the degree of complexity of the project, independent from the complexity of the software produced. (This evaluation should consider such factors as the number of coordination points, number of subcontractors, number of agencies per product, number of internal coordination points, number disciplines involved, number and variety of products produced, number and variety of information sources.) Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Application Software Complexity	19	F-2	x	A complexity rating for the known characteristics of the solution algorithm software being developed. Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Control/Operating System Complexity	20	F-2	X	A complexity rating of the control software or operating system, either being developed or used by the software development project. Rating scale is 1-10, where 1 = easy, 10 = most difficult.	
Support System/ Tools/ Aids Complexity	a	F-2	X	A rating of the complexity in the use, interactions and/or documentation of the support software. Rating scale is 1-10, where 1 = easy, 10 = most difficulty.	

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P1-3 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description	
Data Base Structure Complexity	22	F-2	Х	A rating of the complexity of the dapase, size and structure. Rating so is 1-10, where 1-easy, 10-most difficult	
Quality of Requirement Specifications	23	F-2	en]	An evaluation of the clarity, compleness, implementability and verifiability of the project requirement specifications. Rating scale is 1-10, where 1 = very high quality, 10 = poor quality.	
Quality of Design Specifications	(24)	F-2	X	An evaluation of the design specifications for their completeness, clarity, and detail. Rating scale is 1-10, where l=nign quality, 10=poor quality.	
Schedule Adequacy	(25)	F-2	X	An evaluation of the tightness of project scheduling in view of the total project. Rating scale is 1-10, where ladequate, 10 = most inadequate.	
Overall Project Management Effectiveness	26	F-2	X	An evaluation of the management control of the project based on the stringency of administrative plans, configuration control procedures, technical direction given, etc. Rating scale is 1-10, where l = effective management, l0 = ineffective management.	
Overall Project Personnel Qualifications	(27)	F-2	X	An evaluation of the project personnel including management, technical and administrative support people, in meeting the projects performance goals Rating scale is 1-10, where 1 = highly qualified, 10 = poorly qualified.	
Computer Resources Adequacy	28)	F-2	X	An evaluation of the computer resources and services to meet the requirements of the project. Rating scale is 1-10, where 1 = most adequate, 10 = highly inadequate.	
Customer Supplied Information	(39	F-2	X	An evaluation of the customer supplied data and/or equipment based on the completeness, timeliness and accuracy (freedom from errors and deficiencies) Rating scale is 1-10, where 1 = high quality, 1 = poor quality.	
	1-81			quality, = poor quality.	

P1-3 PROJECT ATTRIBUTES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Timeliness of Review Actions	30	F-2	X	An evaluation of the length of time it takes to process an item through the review and approval cycle, especially in terms of exceeding scheduled review periods and priority, importance or immediacy of the need for a decision. Rating scale is 1-10, where 1 = most expedient, 10 = most time consuming.
Funding Adequacy	3	F-2	X	An evaluation of the adequacy of project funds to meet the software deliverable end items. Rating scale is 1-10, where l = adequate, 10 = most inadequate.
Project Software Type	32	F-12		Indicate the gross classification of programming. Choices include:
				BUSINESS SCIENTIFIC SYSTEMS MAINTENANCE OTHER

P2-3 CONTRACT/CUSTOMER INFORMATION FORM

derightseid	A A A LA LA COMPANIA LA		1975/01/01/01
DATE OF SUBMITTAL:	PROJECT	IDENTIFIER:	2
CONTRACT TYPE 3			
FFP FPE COST	CPIF [CFFF	
LABOR FPI FPIF	cs 🗌	CPAF	
T-M OVH IRAD	OTHER [
NUMBER COORDINATION POINTS:	(4)		
FREQUENCY OF CUSTOMER CONTACT: (5)			
CUSTOMER EXPERIENCE WITH DATA PROCE	~		
CUSTOMER EXPERIENCE WITH APPLICATIO	_		
CUSTOMER EXPERIENCE WITH TARGET COM			
CUSTOMER EXPERIENCE WITH CONTRACTOR	9		
56 24 Detail			
CUSTOMER/CONTRACT EVALUATION RATINGS	_		
Stringency of Review Procedures:	<u>(1)</u>		
Reasonable of Negotiations:	12		
Penalties for Non-compliance:	<u>(a</u>		
Technical Risk:	(14)		
Redirection Rate:			
Contract and Work Compatibility:	<u> </u>		
Contract Renegotiability:	10		
Customer Turnover:	①		
Customer Rapport:	18		
Project Location:	19		
Quality of Physical Facility:	(20)		

P2-3 CONTRACT/CUSTOMER INFORMATION FORM

To be completed and submitted at initiation and completion of the software development project. This form defines the contract terms, conditions, and customer related information. (The information on this form is not appropriate for IRAD and overhead funded software projects.)

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initiation or completion, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Contract Type	3	F-5		The types of contract under which the work is performed, including:
Contactor course Contactor contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contactor Contacto		William (FFP - Firm Fixed Price FP-E - Fixed Price with Escalation FPI - Fixed Price Incentive FPIF - Fixed Price Incentive Free COST - Cost with no Fee CS - Cost Shared with Customer CPIF - Cost Plus Incentive Fee CPAF - Cost Plus Award Fee CPFF - Cost Plus Fixed Fee T&M - Time and Materials LABOR - Labor costs only IRAD - Independent Research and Development OVH - Overhead Other - None of the above
Number Coor- dination Points	4	F-4	X	The average number of contacts necessary to coordinate an action, obtain technical decision, or receive technical direction during the contract period.
Frequency of Customer Contact	(5)	F-4	X	The closeness of liaison with the customer, rated in terms of the average frequency of contact, with designation of the unit of time, d = daily, w = weekly, m = monthly, y = yearly (2W).
Customer Experience with Data Processing	0	F-3.1	10 0 1 10 1 10 11 10 11 10 11 10 11	Years of experience the customer has had in applying data processing to his operational problems.
Customer Experience with Application	9	F-3.1	373	Years of experience dealing with this particular application area.

P2-3 CONTRACT/CUSTOMER INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Customer Experience with Target Computer	8	F-3.1		Years of experience customer has had with the specific hardware equipment.
Customer Experience with Contractor	9	F-3.1		Years of customer interaction with this contractor.
Stringency of Review Procedures	100	F-2	X	An evaluation of the customer's methods of approval and review of plans, specifications, and modification requests in terms of the severity or stringency of the procedures and the strictness with which they are observed. Rating scale is 1-10, where 1 = most reasonable, 10 = most stringent.
Reasonableness of Negotiations	0	F-2	х	An evaluation of the reasonableness of the review and inspection process, and in settling disagreements. Rating scale is 1-10, where 1 = most reasonable, 10 = most unreasonable.
Penalties for Non-Performance	10	F-2	X	An evaluation of the stringency of penalties for non-compliance or disapproval of deliverable items. Rating scale is 1-10, where 1 = realistic penalties, 10 = most severe penalties.
Technical Risk	13	F-2	X	An evaluation of the feasibility of meeting technical performance requirements based on the familiarity and difficulty of the problem and availability of technical skills. Rating scale is 1-10, where l = low technical risk, 10 = high technical risk.
Redirection Rate	13	F-2	X	An evaluation of the rate at which members of the customer's control, monitor, and technical staff (contact points) are replaced. Rating scale is 1-10, where 1 = little or no redirection, 10 = continual redirection.
Contract and Work Compati- bility	13	F-2	X	An evaluation of how well contract provisions match the work to be done. Rating scale is 1-10, where 1 = contract/work is compatible, 10 = contract/work very incompatible.

P2-3 CONTRACT/CUSTOMER INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Contract Renegotiability	9	F-2	Х	An evaluation of the rigidity of contract terms, including provisions for funding and incorporating system modifications (SPR's), resolving problems, obtaining exceptions and waivers, etc. Rating scale is 1-10, where 1 = easy to renegotiate, 10 = difficult to renegotiate.
Customer Turnover	0	F-4	X	An evaluation of the rate at which members of the customer's control and technical staff (contact points) are replaced. Value is given in % per year.
Customer Rapport	(8)	F-2	X	An evaluation of the degree of rapport and understanding with the customer based on the relative frequency and number of conflicts and disagreements. Rating scale is 1-10, where 1 = good rapport, 10 = poor rapport.
Project Location	19	F-2	х	An evaluation of the place of project performance based on the estimated ease of manning, acquiring facilities, making travel accommodations, obtaining employee housing, and accessing the computer. Rating scale is 1-10, where 1 = convenient location, 10 = most inconvenient.
Quality of Physical Facility	20	F-2	X	An evaluation of the working environment for project personnel, based in part on the adequacy of the funding to provide for sufficient office space, amount and quality of equipment, and supplies. Rating scale is 1-10, where 1 = best, 10 = worst.

P3-3 SOFTWARE INSTALLATION INFORMATION FORM

DATE OF SUBMITTAL: ① LOCATION OF TARGET COMPUTER: ③ TES INSTALLATION TECHNIQUE: ④ PARALLEL NUMBER PERSONNEL IN INSTALLATION TEAM: AVERAGE EXPERIENCE OF INSTALLATION TEA ON SITE TRAINING: ⑦ NONE ① EXERCISE ② SOFTWARE ADAPTATION: ⑧ RESOURCE REQUIREMENTS FOR INSTALLATION INSTALLATION DIFFICULTY RATING: ①	ST FIELD MULTI
PROBLEM(S) DESCRIPTION: (11)	
HILLIANS TOTAL OF SET TO MOTTURE AND SET OF	

P3-3 SOFTWARE INSTALLATION INFORMATION FORM

To be completed and submitted at project initiation and completion in the case where software is being developed at a location different than the operational site of the software. This information provides data on the techniques, personnel, resources, and problems of software installation.

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initia- tion or software installation comple- tion, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Location of Target Computer	3	F-6		Check the type of dislocation between development facility and the operational facility. Choices include: TEST - The software is delivered to, or checked out, in a test facility different than the developmental facility. FIELD - The software must be installed.
STAGE CAST BECSOND STAGE CAST BECSOND STAGE STAGE				 in an operational facility located at some distance. MULTI - The software must be installed at several field locations or delivered to many users.
Installation Technique	4	F-8	X	Check the method used to integrate new software into ongoing operations. Choices include: PARALLEL - Both the old and the new system operate in parallel for a period. SWITCH - Operations are switched to the new system without recourse. BACKUP - The old system is retained
				as a fallback capability in case the new system fails.
Number Personnel in Installation Team	(5)	F-4	X	Number of project personnel required to install the new software system on site.
Average Experie of Installation Team	6	F-4	X	The amount of experience in number of months the installation team has with the software system and/or customer and site.

P3-3 SOFTWARE INSTALLATION FORM (cont'd)

Key	Format	E/A	Description
7	F-10	X	Check the method(s) or orientation required to institute operations on the new system. Choices include: NONE No training is required. MANUAL Training manuals or other instructional materials provided. BRIEF Orientation and indoctrination briefings are prepare and presented. LECTURE A series of classroom presentations with audiovisual aids are required. EXERCISE Hands-on training with canned or simulated problems is required.
8	F-4	X	The amount of adaptation (change) that must be done to adapt the software to run on the operational (target) computer, as an approximate in percent of code change.
9	F-8	X	Total resources budgeted (and spent) for adaptation, training, travel, etc. for software installation, in dollars.
0	F-2	X	An evaluation of the impact the installation of the software system has on overall project performance, considering factors such as multiple releases, parallel systems, customer support and/or training. Rating scale is 1-10, where 1 = easy, 10 = most difficult.
0	V-256		Short description of all problems, if any, that occurred during the software installation process. (If SPR's are submitted during the installation process, list the SPR identifiers.)
	(a) (b) (d)	F-10F-4F-8F-2	 F-10 X F-4 X F-8 X F-2 X

P4-3 SUBCONTRACTOR INFORMATION FORM

DATE OF SUBMITTAL: (1) SUBCONTRACTOR IDENTIFIER: (3) SUBCONTRACTOR TYPE: (4) RESPONSIBILITIES: (5)	PROJECT I	DENTIFIER: (2)
EXPERIENCE IN DATA PROCESSING: 6	(10)	S
Subcontractor Rapport: (1)		a statilidformasa a statilidformasa a sometimesu parasana some

P4-3 SUBCONTRACTOR INFORMATION FORM

To be completed and submitted at project initiation and completion for each subcontractor associated with the software development project. This information provides data on subcontractor responsibilities, interfaces, and quality of material furnished.

Parameters	Key	Format	E/A	Description
Date of Submittal	D	F-6		Current date, either project initia- tion or completion, in the format yymmdd.
Project Identifier	3)	F-8		An acronym, number or other identifies that uniquely identifies a project and identifies all data collection forms for the project.
Subcontractor Identifier	3	F-8		An acronym, number or other identifier that uniquely identifies the subcontractor.
Subcontractor Type	4	F-10		A word or phrase identifying the type of service the subcontractor principally supplies.
Responsibilities	5	V-256		Short description of work performed by subcontractor.
Experience in Data Processing	6	F-3.1		Years of experience the subcontractor has had in applying data processing to operational problems.
Experience with Subcontractor	2	F-3.1		Years of interaction with this sub- contractor.
Experience with Application	(8)	F-3.1		Years of experience subcontractor has had in the application of the current nature.
Frequency of Contact	(9)	F-4	X	The closeness of liason with the sub- contractor, rated in terms of the average frequency of contact, with designation of the unit of time, d = daily, w = weekly, m = monthly, y = yearly.
Subcontractor Supplied Information	(19)	F-2	X	An evaulation of the subcontractor supplied software items and/or equipment based on the completeness, timeliness and accuracy (freedom from errors and deficiencies). Rating scale is 1-10, where 1 = good, 10 = poor.
				•

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P4-3 SUBCONTRACTOR INFORMATION FORM (cont'd)

Parameter	l Key	Format	E/A	Description
Subcontractor Rapport	(1)	F-2	X	An evaluation of the degree of rapport and understanding with the subcontrator based on the relative frequency and number of conflicts and disagreements. Rating scale is 1-10, where 1 = good, 10 = poor.
	100022.1N	ATAU 18 BOOL NO		
	(1)		0	
	·			
				CRASING CREAT LEAGUESTANCE TO BASSEARCH
				S carrier describer des facciones de la companie de
				Project Mechan Terrovaya (45)

P5-3 ORGANIZATION INFORMATION FORM

DATE OF SUBM		PROJECT I	DENTIFIER: (2)							
	I IDENTIFIER: (3) _			100000						
-2000 a V V (=)	ORGANIZATION TYPE: 4 LINE MATRIX PM PROJECT PROJ-CPT OTHER									
	ORGANIZATION RESPONSIBILITIES: (5)									
IDENTIFIERS	OF REPORTING ORGAN	IZATIONS: (6)								
		ASSIGNMENT DATA		-						
WORK ID	INITIATION DATE	COMPLETION DATE	PERSONNEL SKILL LEVEL(S)	MANNING						
①	(8)	9	10	n n						
	1.0									
MANAGERIAL T	ECHNIQUE(S) IDENTIF	TERS: 12								
•	TURNOVER DATA:									
	Turnover: (13) nel Turnover: (14)									
Project Me	mber Turnover: (15)									

P5-3 ORGANIZATION INFORMATION FORM

To be completed and submitted at project initiation and completion for each organizational unit. In the event that the organizational unit does not exist for the duration of the project, the form should be completed and submitted at the initial formation of the organizational unit and at the completion of the unit's assignment with regard to the specified project.

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initiation or completion date, yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Organization Identifier	3	F-8		A short acronym or number that uniquely derines the organiztional element within the total project structure.
Organization Type	4	F-10		Check the word describing the internal organization of the element. Sample choices are: LINE - A functionally specialized organization. MATRIX/PM - Personnel in functionally specialized groups when coordinated by a project manager or PMO. MATRIX/P - Personnel from disciplinary or functionally specialized groups, assigned to a project for its duration and returned to the home group upon project termination. PROJECT - An organization formed to work on a specific project. PROJ/CPT - A specific internal project organization, utilizing a Chief Programmer Team. OTHER - None of the above.
Organization Responsibilities	(5)	V-256	X	A brief narrative description of the responsibilities of the organization, including the primary function of the organization, as analysis, design, program, test, configuration control, administrative management, computer operations.

P5-3 ORGANIZATION INFORMATION FORM (cont'd)

6	F-8	Х	A list of apprisational identificus
67513, 60		^	A list of organizational identifiers that report to this organizational unit. (Each Identifier included must have a P5 Form associated with it).
0	F-8	· ·	A name or number uniquely identifying this particular work element, and for which manpower, computer, etc., resources will be allocated. (Each Identifier included must have WI Form associated with it.)
8	F-6	Х	Date work is to be initiated for the work element.
9	F-6	X	Date work is to be completed for this work element.
10	F-2	X	A number designating the level of skil of personnel within the organization for the specified work element. (See Attachment 1 for Personnel Skill Level Description).
(1)	F-4	X	The number of persons of the given personnel skill level assigned to the organizational element for the specified work element.
12	F-20	Х	The technique(s) used in the manage- ment of this organizational unit. Example techniques include:
			CPT - Chief Programmer Teams CM - Configuration Management PPL - Program Production Library BA - Build Approach AT - Automated Tools for Management Visability and Control (Each technique identified should be further described on the P9 Form.)
13	F-4	У	The number of people of managerial level leaving the organizational element before work completion.
	(a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	 8 F-6 9 F-6 10 F-2 11 F-4 12 F-20 	8 F-6 X 9 F-6 X 10 F-2 X 11 F-4 X 12 F-20 X

P5-3 ORGANIZATION INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Key Personnel Turnover Rate	14)	F-4	X	The number of persons identified as Key Persons (e.g., a Chief Programmer) leaving the organization before the work assignments are complete.
Project Member Turnover Rate	15)	F-4	X	The number of persons of all catego- ries leaving the project before the work assignments are complete.
			(å)	SCANSON CONTROL SERVICE SERVICE
				ilemenopement (I) (I) the target department (I)
		291	1,483	1900 - PRY PRINCE TO LISVOU MENTAGUES
				ED I(2) 913 31 1667 WOK

P6-3 EMPLOYEE INFORMATION FORM

DATE OF SUBMITTAL:	0	PROJECT	IDENT	IFIER:	(2)	
MPLOYEE IDENTIFIER:	3						
SKILL LEVEL: 41		5	6	7	8 🗌		
JOB TITLE:	5						
ORGANIZATION IDENTIFI	ER(S): 6	Andrew Color Springer Color		12			
PRODUCTION CONTRACTOR							
YEARS EXPERIENCE	chammitago di						
In Data Processing:	<u>(7)</u>						
With Project Frogra	mming Languag	e: <u>8</u>					
In Application Area							
In Management:	0						
With Target Compute	r: ①						
EDUCATION LEVEL: 12 H	S YRS C	OLLEGE	YRS	*			
	_						
WORK IDENTIFIER(S):	(13)						

P6-3 EMPLOYEE INFORMATION FORM

To be completed and submitted for each employee when assigned to an organization within the project. This form provides information on employee past experience and current work assignments.

Parameter	Key	Format	E/A	Description
Date of Submittal	Û	F-6		Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Employee Identifier	(3)	F-8		A name or number uniquely identifying the project member.
Employee Skill Level	4	F-2		A short name or number designating the level of advancement or skill of the personnel within the organizational element. (See Attachment 1 for Skill Level Classification.)
Employee Job Title	(5)	F-20		A short descriptive phase identifying the position filled by the employee in the organization, e.g., Section Head, Chief Programmer, PPL Librarian, etc.
Organization Identifier	©	F-8	X	A short acronym or number that uniquely identifies the organizational element(s) to which this employee is assigned. (Each Identifier included must have a P5 Form associated with it).
Years Experience in Data Processing	1	F-3.1		The total number of years the employee has been engaged in the data processing field.
Years Experience with Project Programming Language	(8)	F-3.1		The total number of years experience employee has had with the programming language being used by the project.
Years Experience in Application Area	(9)	F-3.1		The total number of years experience the employee has had with the specific data processing application.

P6-3 EMPLOYEE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description				
Years Experience in Management	10	F-3.1		The total number of years experience the employee has had in a position of management or equivalent responsibility.				
Years Experience with Target Computer	11)	F-3.1		The total number of years experience the employee has had with the object computer.				
Education Level	13	F-3.1		The number of years of high school and college the employee has acquired (30 semester hours = 1 year).				
Personnel's Work Identifier(s)	13	F-8	X	A name or number uniquely identifying the work element(s) to which the individual is assigned. (Each identifier included must have a WI Form associated with it).				
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errange er en en en er ere en er en en en en en en en en e				TOTAL TOTAL ACTOR TO THE PROPERTY OF THE PROPE				
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P7-3 COMPUTER EQUIPMENT INFORMATION FORM

DATE OF SUBMITTAL: 1) DEVICE IDENTIFIER: 3	PROJECT IDENTIFIER: (2)
DEVICE DESCRIPTION STATISTICS: Memory Size: 4 Number CPU's: 6 Memory Cycle Time: 8 Unit of Time Measure: 9 Nano	Unit of Measure: (5) Number I/O Channels: (7) Micro Sec Sec
	Midi Maxi Special Purpose
MAJOR INPUT DEVICE TYPE: (13) Card PRODUCT IDENTIFIERS: (14)	Paper Tape Terminal
Teal special angles of castini processor that is associated with the identified component	7 F F (6) 2 F F F F F F F F F F F F F F F F F F
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P7-3 COMPUTER EQUIPMENT INFORMATION FORM

To be completed and submitted at project initiation for \underline{each} computer configuration used by the project for software development. This form identifies the computer equipment capabilities.

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6	ing.	Current date, either project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24		The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.
Memory Size	4	F-10		The amount of information the computer memory can store and base, e.g., 64K.
Unit of Measure	(5)	F-10		The unit by which the storage capacity is measured, e.g., bit, byte, word.
Number of CPU's	6	F-4		The total number of central processing units associated with the identified computer.
Number of I/O Channels	7	F-4		The number of hardware devices that connects the CPU and main storage with the I/O control units.
Memory Cycle Time	(3)	F-8		CPU cycle or access time.
Unit of Measure	89	F-5		The unit by which cycle time is measured, e.g., nanoseconds, microseconds, seconds.
Device Type	100	F-7		The general classification of the computer equipment according to size.
				Mini - A computer with a portable
				mainframe. Micro - A computer that is micro- programmable and is also portable.
				Midi - A medium size computer, e.g., PDP10, IBM 360/20-370/158.
				Maxi - A large scale computer capable of multiprocessing, e.g., CDC 7600, IBM 370/191.

P7-3 COMPUTER EQUIPMENT INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description			
Device Type (cont)		301 F33		Special - Computer built to specific specifica- tions for a particu- lar application.			
Number Sequential Access Devices	11)	F-6		Number of devices providing secondary storage of sequential access type, e.g., tape drives.			
Number Random Access Devices	12)	F-6		Number of devices providing secondary storage of random access type, e.g., discs, drums.			
Major Input Device Type	(3)	F-10		Type of input device that provides the major percentage of input data Choices include: Card - Punched cards Paper tape - Punched tape Terminal - Remote site input			
Product Identifiers	(4)	F-8		Identifiers of product elements using this hardware device. This field may be left blank when a single computer device is used for the development of all products. In the event that more than one device is identified for software development, specify the highest level Product Identifier using the device, e.g., the subsystem name.			

P8-3 COMPUTER SUPPORT FACILITIES INFORMATION FORM

DATE OF SUBMITTAL: 1 PROJEC	T IDENTIFIER: 2
LOCATION OF FACILITY: 3 DEDICATED _ CEN	TRAL TELE COURIER
TRAVEL [
MODE OF OPERATION: (4) BATCH BATCH-RJE	INTERATIVE MIXED
DIRECT	
	R AVAILABILITY: 6
COMPUTER FACILITY EVALUATION RATINGS	
Quality of Equipment and/or Related Serv	ices: (7)
Quality of Operating System and Support	Software: (8)
Quality of Operating System and Support DEVICE IDENTIFIER: (10)	Software Documentation: (9)
man dans been all at associate Its	
164 Daniel Composition (1995) De 1885 (1995) De 188	

P8-3 COMPUTER SUPPORT FACILITIES INFORMATION FORM

To be completed and submitted at project initiation and completion for each computer facility used. This form provides data on the quality and type of computer support facilities used by the project.

Parameter	Key	Format	E/A	Description
Date of Submittal	①	F-6	*	Current date, either the project initiation or completion date, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Location of Facility	3	F-16	X	Check accessibility of the computing facility, equipment and personnel, to the individual user. Choices include: Dedicated - Equipment "owned" and operated by the project. Central - Equipment immediately available but owned by the overall organization and shared with other projects. Teleprocessing - Equipment distantly located but available through a TSS or RJE network. Courier - Equipment distantly located and available through courier service only.
(10) (L) (1) (0) () () (1) (1) (1)				Travel -Equipment distantly located and accessed only by personal travel.
Mode of Operation	4	F-16	X	Check the means of interaction with the computing device. Choices include: Batch - An individual computer job that is grouped with other jobs for processing. Batch-RJE - An individual computer job that is submitted to the computer by a remote job terminal, or other means of entry, but which is subsequently grouped with other jobs for processing.

P8-3 COMPUTER SUPPORT FACILITIES INFORMATION FORM (cont'd)

Key	Format	E/A	Description			
Jed Jednik Jednik Jenik Jenik Jenik	inernal deficiel deces eoros de feu des lest bri serre	M	Interactive - Simultaneous computer processing between individuals at terminals and the computing device i.e., time sharing. Mixed - Both batch and interactive computer processing. Direct - User has complete control of the computing device in running his job.			
(5)	F-3.1	X	The average length of time between the submittal of a job to the computing facility and its return to the requestor. (Omit when Interactive Modeof-Operation is checked.) (hours)			
6	F-3.1	X	The average number of hours per day the equipment is available for developmental use.			
7	F-2	X	An evaluation of the quality of computing equipment and services rendered to the project, with respect to type of services offered, amount of down time of the equipment, etc. Rating scale is 1-10, where 1 = good, 10 = poor.			
(8)	F-2	X	An evaluation of the software associated with the computing equipment with respect to the options offered, e.g., multiprogramming control services, data management capabilities, scheduling and dispatching options, languages supported, error recovery options, etc. Rating scale is 1-10, where 1 = reliable multi-capability support software, 10 = unreliable and/or limited capability support software.			
	(S) (G) (7)	⑤ F-3.1 ⑦ F-2	⑤ F-3.1 X ① F-2 X			

P8-3 COMPUTER SUPPORT FACILITIES INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Quality of Operating System and Support Software Documen- tation	9	F-2	X	An evaluation of the availability and clarity of the documentation supporting the use of the operating system, test and utility tools. Rating scale is 1-10, where 1 = good, 10 = poor.
Device Identifier	10	F-24		The name of the computing device described, including the manufacturer of the equipment, the series number, and the model number. (This field may be omitted if a single computer facility is used.)

P9-3 PROGRAMMING TECHNIQUES INFORMATION FORM

TECHNIQUE IDENTIFIER(S)	TECHNIQUE CLASS(ES)	TYPE C A M O	COS ACQUIRE	ST OPERATE	TRAINING EFFORT	INDEP. RATING	
3	4	(5)	6	1	8	9	

P9-3 PROGRAM METHODOLOGY INFORMATION FORM

To be completed and submitted at completion of the work definition phase and at completion of the software development project. This form provides information on the programming techniques that are both planned and actually used during the development process. All techniques, tools, concepts, etc., used by the project should be identified.

Parameter	Key	Format	E/A	Description
Date of Submittal	1	F-6		Current date, either the completion of work definition or completion of the project, in the format yymmdd.
Project Identifier	2	F-8	(3) (3) (4)	An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
Technique Identifier	3	F-20	Х	A short descriptive title of the technique.
Technique Class(es)	4	F-24	Х	Identification by class of the techniques used by project personnel in the process of developing the software. (Some techniques may belong to more than one class. In such cases, identify all classes) Classes include:
TO TRAFFIC THE PERSON OF THE P				Analysis - The class of techniques used in the analysis phase of software development. Example techniques of this class include modeling, simulation trade-off studies.
A CONTRACTOR OF THE CONTRACTOR				Design - The class of techniques used in the design phase of software development. Example techniques of this class include top-down, modeling, proofs of correctness, informal design, bottom-up, hierarchical structure, modularity.
acque in consider	na loo palloo peeb n kliqus klins o poree	1000 1000 1001 1000 1000	501T 0.320 400 511T 511T	Implementation - The class of techniques used in the implementation phase of software development. Example techniques of this class include modularity, restricting control flow, programming standards, bottom-up, proofs of correctness, program production library.

Parameter	Key	Format	E/A	Description
Technique Class(es) (cont'd)				Management - The class of techniques used in managing the software project directly supporting program production Example techniques of this class include chief programmer teams, configuration management, program production library, build approach.
				Quality Assurance - The class of techniques used by the project to assure software quality. Example techniques of this class include static test tools, dynamic test tools, test teams, top-down testing, bottom-up testing, program production libraries, formal design walk thru.
				Notational Mechanisms - The class of mechanisms used in documenting the software and/or previously mentioned developmental techniques. Example techniques of this class include HIPO, programmer's notebook, decision tables, flowcharts.
Technique Type	(5)	F-2	Х	An indication of the degree of mechanism involved in the application of the technique to the work or product. Choices include:
		Han-sa		Conceptual - Application of an idea to the development process.
				Manual - An established procedure, unaided by automatic means.
				Automatic - A computerized approach to aiding in the solution to the problem.
Among to cally a		100900		mi <u>X</u> ed - Any of the above in combin- ation.
Acquisition Cost	6	F-8	Х	The cost in dollar resources of acquiring or developing the technique or tool, if applicable.
Operation Cost	0	F-8	х	The cost, in dollar resources, involved in using the technique.

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Parameter	Key	Format	E/A	Description
Training Effort	8	F-4	Х	An estimation of the average degree of educational effort required to become proficient in the use of the technique or tool, in man days effort.
Independence Rating	9	F-2	X	The degree to which this technique stands alone; that is, can be used independently of a particular machine, operating system, language, application, or other constraint. Rating scale is 1-10, where I = independent, 10 = dependent.
		asa cse Posuba		

DATE OF SUBMITTAL (1) PROJECT IDENTIFIER:
SOURCE/OBJECT LANGUAGE IDENTIFIER: 3
LANGUAGE COST DATA Language Acquisition Costs: Language Training Costs: 5
PROGRAPMING : WAS TALL MATION RATINGS:
Compiler/Assemble: Reliability: 6 Language Documentation: 7 Language Efficiency: 8 Language Relevance to Project Goals: 9
TOOLS ASSOCIATED WITH LANGUAGE AND/OR COMPILER Program Interface Consistency Checker Cross Reference Analyzer Program Instrumenter Test Control Monitor Debugging Interpreter Test Data Generator Test Data Reducer Macro Preprocessor Reformatter Standards Auditor Other (Specify)

P10-3 PROGRAMMING LANGUAGE INFORMATION FORM

To be completed at project initiation and completion for each programming language used by project personnel. This form provides information on resources expended and capabilities provided in the use of the specific programming language.

Key	Format	E/A	Description
0	F-6		Current date, either project initiation or completion in the format yymmdd.
2	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
3	F-12		Name or designator of the source or object language used, and for which all remaining parameters are associated.
4	F-8	X	The total resources expended in dollars for the acquisition and/or installation of the programming language, if applicable.
(5)	F-8	X	The total resources expended in dollars for the training of project personnel in the use of the programming language, if applicable.
6	F-2	X	An evaluation of the degree of reliability in the use and operation of the language compiler and/or assembler. Rating scale is 1-10, where 1 = very reliable, 10 = unreliable.
1	F-2	X	An evaluation of the accessability and understandability of the documentation supporting the specified programming language. Rating scale is 1-10, where 1 = good, 10 = poor.
8	F-2	X	An evaluation of the operational efficiency of the language within the operating milieu of the hardware/ software support systems. Rating scale is 1-10, where l = efficient, l0 = inefficient.
	(i) (a) (b) (6) (c)	① F-6 ② F-8 ③ F-12 ④ F-8 ⑤ F-8 ⑥ F-2 ⑦ F-2	 F-6 F-8 F-12 F-8 F-8 F-8 F-8 F-8 X F-2 X F-2 X

P10-3 PROGRAMMING LANGUAGE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Language Relevance to Project Goals	9	F-2	X	An evaluation of the programming language in its support of project specific goal, such as programming standards and/or structured programming. Rating scale is 1-10, where 1 = high, 10 = low.
Language Support Tools	10	F-24	X	Check the tools or capabilities associated with the language and/or compiler. Choices include:
TO CONSERVATE TO THE FEBRUARY OF THE PROPERTY		Leab TO		Program Interface Consistency Analyzer Cross Reference Analyzer Program Instrumenter Test Control Monitor Debugging Interpreter Test Data Generator Test Data Reducer Macro Preprocessor Reformatter Standards Auditor Structured Programming Auditor
	et ook	er turker Grysker		A SER (A) REPLACED TO THE RESIDENCE OF T
		9		Sections (S) Secti

P11-3 PROGRAM PRODUCTION LIBRARY

DATE OF SUBMITTAL:		PROJECT	IDEN	TIFIER:	(2)
PPL IDENTIFIER:					
Transfer and that was needed in the con-	<u></u> <u>5</u>	MANUAL		MIXED	
SKILL LEVEL: 6	-				
COST OF ESTABLISHING PPL:	0				
PPL UTILIZATION COSTS:	8				
PPL EFFECTIVITY RATING:	9				
erion no cosquier utiliza ion a PPL eperation: Chulces inclu "Autalatic processing, who	office office office				
presthour a Moraries					
mannery to accept member of the contract to the contract to the contract of th					
orderizes has regain and a control of because of because of because of because of an a control of a control o					
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P11-3 PROGRAM PRODUCTION LIBRARY INFORMATION FORM

To be completed and submitted at project initiation and completion when the project maintains or uses a Program Production Library, or its equivalent. This form provides information on the resources expended on the PPL development and maintenance. (This form should be submitted for each PPL used by the project.)

Parameter	Key	Format	E/A	Description
Date of Submittal	0	F-6		Current date, either project initiation or completion, in the format yymmdd.
Project Identifier	2	F-8		An acronym, number or other identifier that uniquely specifies the project and identifies all data collection forms.
PPL Identifier	3	F-8		An acronym, number or other identifier that uniquely specifies the project's PPL.
Mode of Operation	•	F-8	X	Indication of computer utilization in the PPL operation. Choices include:
				AUTO - Automatic processing, with or without a librarian.
				MANUAL - Maintenance of programs, listings, and data is com- pletely manual, with or without a program librarian.
				MIXED - Both manual and automatic means are used to maintain the library, with or without a librarian.
Manpower Resource	(5)	F-8	X	The amount of manpower allocated in man-months for the operation of the PPL.
Skill Level	6	F-2	X	The skill level of the personnel responsible for the operation and maintenance of the PPL, or the average skill level of the group of people contributing to the operation of the PPL. (See Attachment 1.)
Cost of Establishing PPL	1	F-8	X	Total resources in dollars expended for establishing the davices needed to support the PPL concept. (The dollar amount should indicate all software, documentation, and personnel training involved in developing the PPL and related tools. It should not include maintenance costs.)

P11-3 PROGRAM PRODUCTION LIBRARY INFORMATION FORM (cont'd)

) F-8) F-8		The total dollars spent to maintain the PPL, excluding computer costs.
) F-8	X	
		The cost of computer resources, including CPU time and storage, for the support software directly maintaining the PPL as automatically calculated by the software.
) F-2	X	An evaluation of the overall effectivity of the PPL with respect to configuration control, management visability, ease of program and test case maintenance, software development data collection and reporting, and ease of use. Rating scale is 1-10, where 1 = effective, 10 = ineffective.
		0
		PROPERTY TOURS TEEL (19)
) F-2) F-2 X

W1-3 WORK DEFINITION INFORMATION

DATE OF SUBMITTAL WORK LEVEL: (3) Pro WORK IDENTIFIER: WORK DESCRIPTION:	4	PROJECT IDENTIFIE Task Acti	R:(2)
IDENTIFIERS OF RE	PORTING WORK ELE	MENTS: 6	
INITIATION DATE:() TERMINATOR:(9)		COMPLETION DATE: (8	
	RESOURCE UTIL	IZATION DATA	
RESOURCE ID	UNIT	ALLOCATED	EXPENDED
		(12)	
PRODUCT IDENTIFIE	RS: <u>(14)</u>		

W1-3 WORK DEFINITION INFORMATION FORM

The Work Definition Information Form provides data on the work breakdown structure in an hierarchical manner, showing the relationship of all work elements and the chain of authority for each work element the software development project has defined. The form is to be completed and submitted at project initiation, work plan formation, or when the work package allocation is changed. A Work Definition Information Form is to be completed for each element for which resource allocation is made.

Parameter	Key	Format	Description
Date of Submittal	1	F-6	Current date, either project initiation, work plan formation or change in work plan definition, in the format yymmdd.
Project Identifier	(2)	F-8	An acronym, number of other identifier that uniquely specifies the project, and identifies all data collection forms.
Work Level	(3)	F-8	Indication of the work breakdown level. Choices are project, phase task, activity.
Work Identifier	(4)	F-8	A name or number uniquely identifying this particular work element, and for which manpower, computer, etc., resources will be allocated.
Work Description	(5)	V-256	A brief narrative description of the work to be performed including the purpose, scope and method for this element.
Identifiers of Reporting Work Elements	6	F-8	Identification of all of the elements into which this work element is subdivided.
Initiation Date	(1)	F-6	The calendar date for starting the work element, in the form yymmdd.
Completion Date	(8)	F-6	The calendar date for completing the work element, in the form yymmdd.
Terminator	9)	F-12	The action taken that completes the work element being defined. This may be a milestone, identified on the W8 form, an informal review, or a delivery.

W1-3 WORK DEFINITION INFORMATION FORM (cont'd)

Parameter	Key	Format	Description
Resource Identifier	@	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type, travel type, computer time, storage, etc.
Resource Unit	(1)	F-10	The basic unit of expenditure of the resource, as manhours, mandays, hours, minutes, etc.
Resource Allocated	12	F-8	The total amount of the resource unit allocated or budgeted for the total work element.
Resource Expended	13	F-8	The amount of allocated resource expended to the reporting date for this work element. (Generally, this field is blank since the form is submitted at initiation of the work element, prior to resource expenditures. However, in the event that resources have been expended, include all expenditures for this work element to date.) Calculated from monthly status reports after initial input.
Product Identifier(s)	14	F-12	The unique identifier of the specific product, or service, whose production is evaluated. (The combination of characters uniquely identifying the work element and associated products together form the key by which all products within all work elements can be identified. Resource expenditures and productivity data are periodically collected via these identifiers.) All products identified must be described on the W2 Product Identification Form.

W2-3 PRODUCT IDENTIFICATION FORM

DATE OF SUBMITTAL: 1	PROJECT IDENTIFIER	:2
PRODUCT IDENTIFER: (3) MOD): (4) V	ERSION: 5
PRODUCT TYPE: 6 Document Progr	ram Data	Test 🗌
Service Other		
REPORTING LEVEL: 7 System System	ıbsystem [] Mod	ule 🔣
PRODUCT DESCRIPTION: (8)		FRATTINGE THE WASEL OF
Same and the contract of the contract of		
IDENTIFIERS OF PRODUCT COMPONENTS: (9	18
PRODUCTION DATA RELATED TO PRODUCT		
Work Unit: (10) Size: (11)	cost: (12	2)
PROGRAMMING LANGUAGE DATA		
Language Identifier: (13)		tion bases of
Language Relevance for Product: (14		
Language Efficiency for Product: (1	5)	
PRODUCT EVALUATION RATINGS		
Product Complexity: (16) Product Familiarity: (17)		
Product Stability: (18)		
Troduct Stability. (ii)		
PROGRAMMING	TECHNIQUES USED	
TECHNIQUE ID	RELEVANCE RATING	INTEGRATION RATING
19	20)	(1)

W2-3 PRODUCT IDENTIFICATION FORM

To be completed and submitted at completion of the work or product definition phase and at completion of the software development project for each product being developed. This form provides information identifying each configuration item, its hierarchical structure, complexity, and resources allocated.

Parameter	Key	Format E/A	Description
Date of Submittal	①	F-6	Current date, either project initiation, work plan formation or change in work plan definition, in the format yymmdd.
Project Identifier	②	F-8	An acryonym, number or other identifie that uniquely specifies the project and identifies all data collection forms.
Product Identifier	(3)	F-8	A name or number uniquely identifying the configuration item or product.
Product Mod Number	4	F-2	Modification number, reflecting the sequence of product evolution.
Product Version Number	(5)	F-2	The model or build numbers, reflecting the sequence of product releases.
Product Type	(6)	F-12	The general class of the product described. Choices include:
			Document - all written material.
			Program - Systems, subsystems, pro- grams.
			Data - Data base
			Test - Test case
			Services - Data processing related services.
			Other - None of the above.

Parameter	Key	Format	E/A	Description
Reporting Level	0	F-9		Level of software configuration. Choices include:
				Module - A software entity that is discrete and identifiable with respect to designing, compiling and loading.
Mile tolony to accommend to the to stage that the actor will only the actor will only				Subsystem - A subordinate system, consisting of one or more interacting modules (It is usually capable of operating independently of, or synchronously with, a controlling system.)
				System - An organized set of software modules and/or subsystems, data base elements, and user producedures created to perform a set of specific functions.
Product Description	(8)	V-256		A short narrative description of the configuration item or product including the objective, function, general composition and/or operation.
Identifiers of Product Compon- ents	9	F-8	X	Identification by identifier of all components of the next lower hierarchy of products, if any.
Work Unit	100	F-10		The unit by which work productivity on this product is measured, e.g., lines of source or object code, pages of documentation, records of data, manhours of work service.
Size	Ü	F-8	X	The number of Work Units required to produce the specified product.

W2-3 PRODUCT IDENTIFICATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Cost	(12)	F-8	X	The value of the resources expended in the production of the product. (If more than one type of resource is expended, resource values should be reduced to common base such as dollars.)
Programming Language Identifier	13	F-12	lar,	The name or designator for the language in which the product is written, if applicable.
Language Relevance to Product	14	F-2	X	An evaluation of the relevance of the programming language to the software problem, considering the development methodology used. (Pating scale is 1-10, where I = relevant, IO = irrevelent.)
Language Efficiency for Product	(15)	F-2	Х	An evaluation of the operational efficiency of the language, considering the hardware/software support systems. (Rating scale is 1-10, where 1 = efficient, 10 = inefficient.)
Product Complexity	(16)	F-2	X	An estimate of the complexity level of the product based on the number of product interfaces and/or processing decisions. (Rating scale is 1-10, where 1 = easy, 10 = most difficult.)
Product Familiarity	1	F-2	X	An estimate of how well the configuration item or product and its characteristics are understood, based on the amount of research and development or analytic effort necessary to its complete definition. (Rating scale is 1-10, where 1 = familiar, 10 = most unfamiliar.)
Product Stability	(18)	F-2	X	An evaluation of the amount of change encountered in producing the configuration item or product. (Rating scale is 1-10, where 1 = stable, 10 = most unstable.)

W2-3 PRODUCT IDENTIFICATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Technique Identifier	19	F-20	X	A short descriptive title of the technique(s) used.
Relevance to Product	20	F-2	Х	An overall rating of the specific applicability of the technique to the application problem solved. Rating scale is 1-10, where 1 = most relevant 10 = irrevelant.
Integration Rating	(a)	F-2	X	A rating of the degree to which this technique is integrated with, or supports, other tools and techniques, as a compiler might enforce programming standards. Rating scale is 1-10, where l = well integrated, 10 = poorly integrated.

W3-3 PROJECT PERFORMANCE INFORMATION FORM

DATE OF SUBMITTAL: ORGANIZATION IDENTIFIER: ORGANIZATION IDENTIFIER:										
967 61	PRODUCTION DATA									
WORK ID	PRODUCT ID	RESOURCE ID	RESOURCE UNITS EXPENDED	WORK UNITS PRODUCED	PRODUCT STATUS					
4	(5)	6	①	(8)	9					

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W3-3 PROJECT PERFORMANCE INFORMATION FORM

To be completed and submitted at the end of each reporting period (A reporting period of no greater than one month is recommended.) The information reported must indicate the work progress and resource expenditures for the reporting period, and should not reflect information reported in a previous reporting period. This form provides information on resource expenditures, productivity data, and work and product status.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	2)	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Organization Identifier	3	F-8	A short acronym or number that uniquely defines the organizational unit, and for which resource data may be accumumulated.
Work Identifier Product Identifier	46	F-8 F-8	The combination of the work and product identifiers together form a unique acronym, number or name by which total expenditures for the product and/or work element and/or organizational unit may be accumulated. All work elements and/or products for which progress was made, or resources expended, during the reporting period must be listed.
Resource Identifier	6	F-12	A short name identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type, travel type, computer time, storage, etc. All resources expended during the reporting period must be listed.
Resource Units Expended	(7)	F-10	The number of resource units (e.g., computer time, manpower) spent during the reporting period. (The unit of measure has previously been identified on the WI form, and need not be specified.)
Work Units Produced	8	F-10	The amount of work units (e.g., lines of source code, pages of documentation) produced during the reporting period. (The unit of measure has previously been identified on the W2 form, and need not be specified.)

W3-3 PROJECT PERFORMANCE INFORMATION FORM (cont'd)

Parameter	Key	Format	THE STREET LAD	Descripti	on
Product Status	roduct Status 9 F-10			ing the repo	mplished for the rting period.
			Started - Wo	ork was init	iated
			Continuing .	- Work is co	ntinuing
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					that the milestone
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W4-3 SOFTWARE PROBLEM REPORT (SPR)

DATE OF SUBMITTAL: (1) PROJECT IDENTIFIER: (2)
SIN IDENTIFIEN.
SPR TYPE: 4 FR DC MC EF ED EC
EMPLOYEE IDENTIFIER: (5)
DATE OF PROBLEM DISCOVERY: 6 TIME OF DAY: 7
WORK IDENTIFIER IN PROGRESS: 8
STATUS: 9 OPEN CLOSED PENDING OTHER
PRODUCTS IMPACTED BY PROBLEM: 10
The state of the s
PRODUCTS USED WHEN PROBLEM OCCURRED:
Data Base Identifier: (11)
Test Case Identifier: (12)
Test Tool Identifier: (13)
PROBLEM DESCRIPTION: (14)
NAME OF THE PARTY
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DATE RECEIVED: (15) EMPLOYEE ASSIGNED: (16)

W4-3 SOFTWARE PROBLEM REPORT (SPR)

To be completed and submitted to the project office by project personnel when a problem is discovered in the software or other associated product items. The SPR is submitted to the RADC repository at the established reporting period. This form provides information on discrepancies found in any configuration item.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
SPR Identifier	3	F-8	A unique number, name or other identifier assigned by the project configuration management office or project office. Assigned to SPR's in sequence; current military practices use the following conventions:
			ECPxxx - Engineering Change Proposal for changes.
			SPRxxx - Software Problem Report for corrections.
			DRFxxx - Discrepancy Report Form for corrections (If the SPR or DRF results in a requirements or design change, an ECP is generated.)
SPR Type	4	F-2	The general class of problem involved. Sample choices include:
			FR - Changes in functional requirements DC - Changes in designed configuration MC - Changes to a finished product EF - Errors in a functional analysis or requirement ED - Errors in a proposed design EC - Errors in a finished product
Employee Identifier	(5)	F-8	A name or number uniquely identifying the project member. (To be used by project office only).

W4-3 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Date of Problem Discovery	6	F-6	Date the problem is discovered by the project employee, in the form yymmdd.
Time	1	F-4	Exact time of day on the above date that the problem was discovered, in the form hhmm.
Work Identifier in Progress	8	F-8	Identification of the work element in progress during which the problem was discovered. In the event that separate testing periods were not identified as activities on the WI - Work Definition Form, the following test periods are suggested:
			U - Unit (or module) test I - Integration test S - System test A - Acceptance test O - Site or installation test
Status	9	F-8	Indication of the action taken by the project manager's office. Choices include:
			OPEN - Problem is being studied to determine the appropriate action.
			CLOSED - Problem is fixed.
			PENDING - Problem is deferred, not reproducible, or of low priority.
			OTHER - Explain below.
Product(s) Impacted by Problem	100	F-8	<pre>Id(s) of the product elements that appear to be involved in the problem (Include mod and version number where appropriate.)</pre>
Data Base Identifier	11)	F-8	Id of data base used when problem was discovered, if applicable.
Test Case Identifier	12	F-8	Id of test case used which demonstrated the error, if applicable.
Test Tool Identifier	13	F-8	Id of test tool, driver or other program used which demonstrated the error, if applicable.

W4-3 SOFTWARE PROBLEM REPORT (SPR) (cont'd)

Parameter	Key	Format	Description
Problem Description	14	V-256	Description of the problem, including the symptoms, and possible impact on other product or work elements.
Date Received	15)	F-6	Date the SPR was received by project manager's office and assigned to project personnel for appropriate action, in the format yymmdd, if applicable.
Employee Assigned	(6)	F-8	A name or number uniquely identifying the project member responsible for correction. (To be used by project office only.)
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W5-3 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

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DATE OF SUBM		_			IDENTIFIER: (2	
SMT IDENTIFI	ER: _	(3)		_ DATE OF	CORRECTION: (4	
TIME OF DAY	OF COR	RECTIO	N: <u>5</u>	_		
EMPLOYEE IDE	NTIFIE	R: <u>6</u>)			
SPR(s) RESOL	VED:	7)			react screenus nCi
					8917701	HE 6786, 250-16
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			PRODUCT M	ODIFICATIO	N DATA	
PRODUCT IDENTIFIER	OLD MOD	NEW MOD	UNIT OF CHANGE	AMOUNT CHANGE	DIFFICULTY RATING	WORK IDENTIFIER
(8)	9	(10)	(11)	(12)	(13)	(ii)
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TYPE OF SOFT	WARF T	FRMINA	TION: (15) NORMAL	ABNORMAL	
			_		_	COLUMN THE
WORK IDENTIF				ERROR GENE	KATED: (16)	
RESOURCE UTI	_			CDU Timo.	(ii)	
Manpower: (_	_		CPU Time:	(18)	
ERROR DESCRI	PTION:	(19)				
-						

w5-3 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

ERROR TYPE: (20)	
Computational	
Configuration	
Data Base Interface	
Data Handling	
Design	
Documentation	
Global Data Definition	
Hardware	
I/0	
Logic	
Operator	
O-S/System Support Interface	
Requirements Compliance	<u>Ul m</u> 16, 16 1
Recurrent	
Routine/Routine Interface	
Routine/System Interface	
Tape Processing Interface	
Unidentified	
User Interface	
User Requests	
принци	
DATE RECEIVED: (21)	
The second secon	

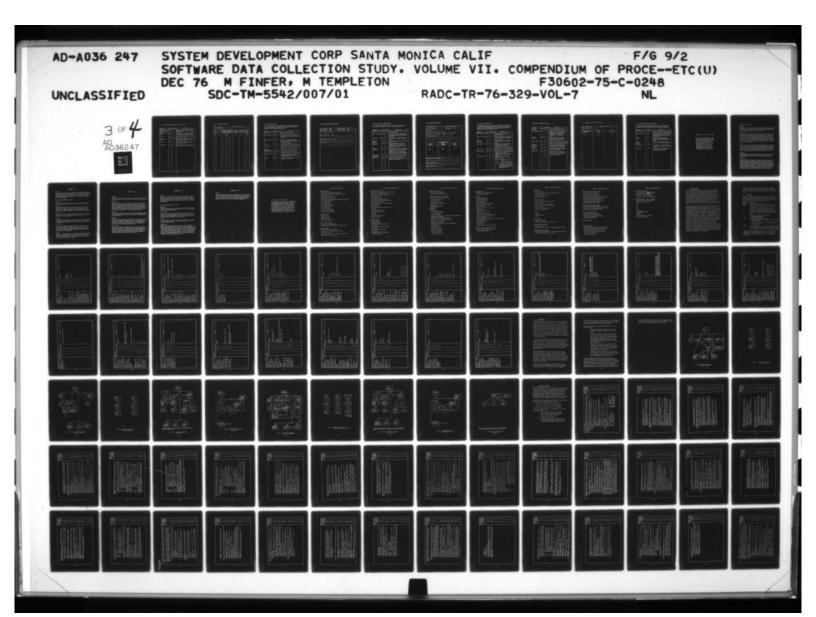
W5-3 SOFTWARE MODIFICATION TRANSMITTAL (SMT)

To be completed and submitted to the project office upon successful software modification by the responsible employee. The SMT is submitted to the repository at the established reporting period.

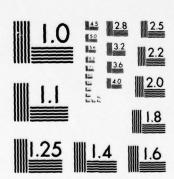
Parameter	Key	Format	Description
Date of Submittal	①	F-6	Current date of reporting period, in the format yymmdd.
Project Identifier (2) F-8			An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
SMT Identifier	(3)	F-8	An alphanumeric identifier uniquely identifying a change or package of changes to a product. (The identifier is normally composed of a set of initials identifying the type of change package and a number indicating the sequential number of the change.) Existing military practices adhere to the following conventions:
a is more to to our posts our posts our posts of the period of the perio	399 (5) (1) (3) (2) (1) (3) (4) (3) (2) (4)	cales the weeks and to a monosite colonya	VDDXXX - A Version Description Document accompanying a new model or release of a system specifying which changes have been incorporated to which models of the system.
on The Legach Value of the Jeffs andportable Legach	artsini artsini atitus atas en	Annaen Lo Life i sai Life y fasi Life y fasi Life i sai	SCNXXX - A Specification Change Notice accompanying a package of change pages to a design specification, test plan or other document.
nel statono el 1ese dotabe nes ensinos	1122 575 7 2000	0 000 0 540 0 541	CRXXX - A Change Report covering a series of Class II (non-cost, non-impact) changes that have been made to the system.
Date of Correction	4	F-6	The calendar date the error was corrected, in the format yymmdd.
Time of Day of Correction	5	F-4	The time of day on the above date the error was corrected, in the format hh:mm.
Employee Identifier	6	F-8	The name or number of the employees responsible for modification. (To be used by project office only.)
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W5-3 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

Parameter	Key	Format	Description		
SPR's Resolved	7	F-8	A list of Software Problem Report Identifiers that this modification package resolves, or partially resolves. (If the SPR is partially resolved, a P should be appended to the SPR number, e.g., CR123P.)		
Product Identifier	8	F-8	The name(s) of the product items containing or impacted by the error. When the error is found to be in more than one product, list all products, e.g., documents, data base.		
01d Mod	9	F-2	Modification number of the product containing the error.		
New Mod	10	F-2	New modifiction number assigned to the product being altered, if applicable.		
Unit of Change	(II)	F-10	The unit used to measure the size of a change, as lines of code, or pages of documents.		
Amount Change	12	F-8	The volume and direction of change as a result of the modification, + = addition, - = deletion, / = change.		
Difficulty Rating	(<u>i</u>)	F-2	An evaluation of the degree of difficulty in implementing the change. Rating scale is 1-10, where l = easy, 10 = extremely difficult. (The difficulty rating should be estimated with regard to the impact the error had on the specific product.)		
Work Identifier	14	F-8	Name of the work element in progress for the specific product when the correction was made.		
Type of Software Termination	15	F-8	Indicate how the software terminated processing when the error occurred. NORMAL - Normal processor termination ABNORMAL - Abnormal processor termination.		



3624



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

W5-3 SOFTWARE MODIFICATION TRANSMITTAL (SMT) (cont'd)

Parameter	Key	Format	Description
Work Identifier in Progress when Error Generated	(16)	F-8	Identify as near as possible the work element in progress in which the error was generated.
Manpower Resource Data	17)	F-4	Indicate in days the amount of manpower resource needed to correct the error and install the software modification.
CPU Time	18	F-4	The exact amount of CPU time in minutes used to correct the error.
Error Description	19	V-256	Description of the error, including the accuracy of the error description on the associated SPR(s).
Error Type	20	F-28	Identify the error type within the Error Categories on Attachment 2 that best fits this error.
Date Received	(21)	F-6	Date the project manager's office received the SMT, in the format yymmdd.

W6-3 SOFTWARE OPERATIONS LOG

LOG JOB	COM	PUTER DATE	JOB	ACCE	PTANCE	COMPUTER	COMPLETION	CPU TIME		
DATE	ID	MO	DAY	HR	MIN	SEC	- OPERATIONS	CODE	MIN	SEC
4	(5)	1101 15W ² 1 15.3.3	1.5 bi 02 30 6 30	6	eday eday they	bos bos ani	1	8	SNI7	9
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W6-3 SOFTWARE OPERATION LOG

To be completed and submitted by the project librarian, or data collection clerk, in the event that a sof*ware monitor does not automatically collect computer run information. The data should be submitted to the RADC Repository at the established reporting period.

Parameter	Key	Format	Description		
Date of Submittal	1)	F-6	The current date of the reporting period, in the form yymmdd.		
Project Identifier	Project Identifier 2 F-8		An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.		
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.		
Log Date	4	F-6	The current calendar date of the computer operations, in the form yymmdd.		
Job Identifier	5	F-8	A unique number or other identifier that uniquely specifies the components of the computer job. (Specified on a W7 Form.)		
Computer Job Acceptance Time	6	F-10	The date and time of day the job was accepted by the computer, mmddhhmmss		
Computer Operations	7	F-24	A list of each job step or type of computer operations performed in this job		
Completion Code	8	F-4	The status indicator for the job step or computer operation in the job. (Completion code identification may be input by the DI form.)		
CPU Time	9	F-6	The total time used by each job step or operation in this job, mmss		

W7-3 JOB IDENTIFICATION INFORMATION FORM

JOB IDENTIFIER: 3	PROJECT I			(4) (5)						
TEST CASE IDENTIFIER: (5)										
PRODUCT IDENTIFIER(S): 6	6 0A	8-1		melflamobi acepe						
TECHNIQUE/TOOL IDENTIFIER(S):	1 967 1 qua	86.3	60							
DESCRIPTION: (8)	bes									
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W7-3 JOB IDENTIFICATION INFORMATION FORM

To be completed and submitted by project personnel upon completion of test case definition or change to a previously identified job definition.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Date of test case definition or change in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms for the project.
Job Identifier	3	F-8	A unique name or number identifying the components of this specific computer run.
Employee Identifier	4	F-8	A name or number uniquely identifying the project member.
Test Case Identifier	(5)	F-8	A short name or number uniquely identifying the test case used in the computer job. (This test case may or may not have been identified as a product on a W2 Form.)
Product Identifier(s)	⑥	F-8	The name or number uniquely identifying the configuration item(s) being tested by the specified test case for the computer job. (In the event that a configuration item is specified that consists of many sub-items, the highest level identifier should be specified.)
Technique/Tool Identifier(s)	1	F-20	The title of the technique or tool used for the computer job, if applicable.
Description	8	V-256	A brief narrative describing the objective of the computer run utilizing the specified components.
			(a) ESTAGLISHED (D)
			Т. (б) эксплатияны

W8-3 MILESTONE INFORMATION FORM

DATE OF SUBMITTAL: 1	PROJECT II	DENTIFIER: ②	
MILESTONE IDENTIFIER: 3	WORK IDENT	TIFIER: 4	
DATE OF EVENT: 5	(350.07)		
MILESTONE TYPE: 6 REV	IEW DELIVERY TE	EST OTHER	
MILESTONE STATUS: 7 PE	ENDING COMPLETE	OPEN	
MILESTONE DESCRIPTION: (B		
and the section of			
	MILESTONE SUB-EVENTS	and the second	
WORK IDENTIFIER	PRODUCT IDENTIFIER	PRODUCT STATUS	
9	10	(1)	
PRODUCT IDENTIFIER(S) BAS	SELINED: 12	(20+e/3/ameb1)	
SPR(s) ESTABLISHED: 13			
AUTHENTICATION: 14			

W8-3 MILESTONE INFORMATION FORM

To be completed and submitted at completion of the work definition phase and at completion of the milestone event for each milestone in the software project. This form provides information on the product and/or work status, criteria for successful completion of the milestone, and error reports generated as a result of the milestone event.

Parameter	Key	Format	E/A	Description
Date of Submittal	①	F-6	X	Date of project initiation or completion of the milestone event, in the format yymmdd.
Project Identifier	2	F-8	•	An acronym, number or other identifier that uniquely specifies a project and identifies all data collection forms
				for the project.
Milestone Idantifier	3	F-8		A unique alphabetic or numeric name designating a specific milestone event.
Work Identifier	4	F-8		Identification of the work element whose successful completion is to be evaluated. (This field may be omitted if the milestone is not associated with a single work element.)
Date of Event	(5)	F-6		The date, scheduled or actual, of the milestone event, in the format yymmdd.
Milestone Type	6	F-16		The general class of event taken as an index of project progress and product quality. Choices include product review, product delivery, performance test, other (described
Milestone Status	7	F-8		in (8)). Checks the current status or processing of a milestone event. Choices include:
				Pending - Milestone event has been scheduled.
				Complete - Milestone event has been successfully completed.
				Open - Milestone event has occurred and revisions, errors, or other modifications to product or work elements are required for successful closure.

W8-3 MILESTONE INFORMATION FORM (cont'd)

Parameter	Key	Format	E/A	Description
Milestone Description	8	V-256		A narrative description of the milestone event, including the purpose
Work Identifier(s)	9	F-8	X	Specify the work element to be completed as a criteria for milestone acceptance. (This field may be omitted when the work element identified in 4 applies to all products.)
Product Identifier	10	F-8	Х	Specify the highest-level product identifier for the work element specified that is to be evaluated during the milestone event.
Product Status	11)	F-20	X	Indicate the status that the specified product is to hold at the time of the milestone event: complete, pending, etc.
Product Identifier(s) Baselined	12	F-8	X	Specify the Product Identifiers that were approved or baselined during the milestone event, if applicable.
SPR(s) Established	(13)	F-8	X	A list of Software Problem Reports (SPR) that were written as a result of the milestone event.
Authentication	14	V-100		A reference to the vehicle used to indicate the formal acceptance of the product or service (including the countersigning of a specification or other product.)
		52.00 m		10 8-7 157 Substance enclosers
		enroles		
ned god thous 4565 Joseph Villia	a: 16 aaue			
ernegos etentneve, o o so intentioned l no-doubone so tento nomiuner son tamos number o intentioned	ne sasti nene sa soli ili sila la sa finassan	0.900		

D1-3 COMPUTER OPERATIONS IDENTIFICATION FORM

DATE OF SUBMITTAL: 1 DEVICE IDENTIFIER: 3	PROJE	ROJECT IDENTIFER: 2			
COMPUTER OPERATIONS IDENTIFIERS	COMPLETION CODE		DESCRIPTION		
4	(5)	2 8 1		6	
chartest potential tractions. The success of the su		10 0			
despite aperators		51-1			
aboo morter,moo ofte tolkymoo baltisegalani		- 4 3			
one seaming of the state of the		.835 v			

D1-3 COMPUTER OPERATIONS IDENTIFICATION FORM

To be completed and submitted by the project librarian or equivalent prior to computer usage by project personnel. This form defines the computer operations and associated completion codes for each computing device used.

Parameter	Key	Format	Description
Date of Submittal	①	F-6	Prior to completion of the W6 - Software Operations Log, in the format yymmdd.
Project Identifier	2	F-8	An acronym, number or other identifier that uniquely specifies a project, and identifies all data collection forms for the project.
Device Identifier	3	F-24	The name of the computing device employed, including the manufacturer, the series number, and the model number.
Computer Operations Identifiers	4	F-12	The name of the computer operations available for use by project personnel.
Completion Codes	(5)	F-4	The alpha or numeric completion code associated with the specified computer operations.
Description	6	V-256	A description of the meaning of the specified completion code for the specified computer operation.

ATTACHMENT 1 - SKILL LEVEL CLASSIFICATION

The skill level positions herein defined represent eight typical data processing positions, two non-exempt and six exempt, two of which include management roles. Due to the wide range of positions found in the software industry, these positions have been chosen as a subset of the entire set. The objective of defining skill levels as a separate attachment allows for flexibility in these definitions, as well as allowing for expansion or contraction of skill levels as the need becomes apparent.

DEFINITION OF NON-EXEMPT JOBS:

POSITION I:

Performs basic clerical assignments required in the data processing cycle such as assisting in the updating of data processing source reference files, translating verbal or graphic data into codes, and/or assisting in reviewing data processing documents before and after machine production.

Typical Duties:

Maintains updated data processing source reference files, as directed, by performing such duties as assembling, sorting and reducing pertinent data in accordance with established data processing procedures. Also, prepares graphic or tabular statistical presentations and summaries. Translates verbal, graphic, and other data into standard machine acceptable codes. Assists in the review of various data processing documents before and after machine processing as well as the punched card and other reference files for the purpose of eliminating clerical or system errors. Reviews items such as code identification, legibility, completeness, continuity, and conformance to establish data processing specifications.

Comments:

Requires the ability to operate typewriter, adding machine, calculator, keypunch, or similar machines. Requires the ability to maintain a very high degree of accuracy and legibility in code and symbol manipulation. Requires the ability to apply a very broad variety of arbitrary codes and translate into compatible machine codes. Requires the ability to perform detailed work accurately, and to reduce voluminous material into useful data. Requires the ability to effectively document, disseminate, and correlate technical data.

POSITION II:

Performs program production library assignments, including gathering, filing, and distributing technical documents and other data, maintaining computer programs pertinent to library operations, and producing automated library catalogs.

Typical Duties:

Performs tasks associated with library operations to include procuring, indexing and filing pertinent documents, coding data for producing the library catalog, preparing special and source listings, and storing, handling, and regulating the flow of documents among users. Coordinates with users to collect program decks, listings, magnetic tapes, paper tapes, and documentation for the library; incorporates these materials into the library's computer based catalog system. Reviews user's submittals to the library to verify accuracy and content in accordance with computer system specifications and restrictions; accepts or rejects submittals to the library on the basis of this review, and coordinates with the submitter to resolve problems.

Comments:

Normally requires at least one year experience in data processing. Requires a general knowledge of project activities and a knowledge of library operations, cataloging, users' documentation systems, and the ability to interact and coordinate with internal and external users. May require the ability to use the following equipment: computer terminal and peripheral equipment, calculator, and typewriter.

DEFINITION OF PROGRAMMER POSITION LEVELS:

POSITION III:

Develops fundamental programming skills by receiving instructions in basic principles and techniques of EDP, most frequently through on-job training.

Typical Duties:

Prepares detailed flow charts from general program statements; translates flow charts into assembly or compiler languages; develops test data and routines which he applies to checking out his program; documents the procedures used in standard terminology. Requires direct constant supervision, with particular emphasis on technical training and professional development.

Comments:

Includes persons who have completed initial orientation with introductory training courses as well as those who are beginning to perform as professional programmers. Average programming experience: 1-1.5 years.

POSITION IV:

Performs all functions of digital computer programming. Continues extensive development of programming skills and techniques through greater variety of work assignments, broader level of responsibility, and increased complexity of assignment.

Typical duties:

Reviews and interprets basic systems designs and specifications; creates general, as well as detailed, complex flow charts; translates complex flow charts into assembly or compiler languages; develops test data and routines required for program checkout; documents all procedures utilized by the program. Requires direct supervision with continuing emphasis on technical training and development.

Comments:

Performs as the journeyman applications programmer, handling modification and adaption of existing programs, as well as writing new programs that utilize standard procedures and techniques. Frequently assigned to activities such as payroll, inventory control, engineering statistics, personnel, etc. Average programming experience: 3-4 years.

POSITION V:

Concentrates general programming experience into specialized skills area such as: design, formulation, or implementation of complex computer programs and systems.

Typical duties:

Establishes program system elements needed to achieve specific objectives sought by each organizational unit concerned; reviews hardware capabilities and new technological changes; determines cost and quality choices as a basis for measuring the feasibility of various programming system approaches; submits, for management approval, proposals for new or revised programming systems; formulates design specifications to meet the objectives of new or revised systems; writes general and/or detailed flow charts for major new or revised complex programming systems. Requires general supervision.

Comments:

Depth experience provides the basis for specialization; permits the programmer to build efficiencies and economies into the complete computer operation. For most computer user installations this would represent the highest level of programming required.

POSITION VI:

Researches "first-time" approaches and techniques for application to original or established computer programming systems, utilizing advanced knowledge of scientific, mathematical, or economic disciplines and an expanding understanding of computer methodology and technology. Commands the ability to exercise advanced creativity and inventiveness in the development and design of original, major computer programming systems.

Typical duties:

Specifies general programming design concepts for "first-time" programming systems; conducts research in automation techniques which significantly extends the state of the art; recommends new or revised hardware capabilities which result in significant changes to general programming activities; acts as senior programming systems consultant in advanced computer system technology; consults with computer design engineers in the development of original hardware systems. Requires minimum supervision.

Comments:

Frequently, an "individual contributor" functioning at a level equal to, or above, the typical first level of data processing management. Works at the highest level of creativity and originality. This activity is rarely found in computer installations of commercial organizations. In total, the population of POSITION V probably does not exceed 5 percent of the programming profession.

DEFINITION OF MANAGEMENT POSITION LEVELS

POSITION VII:

Organizes and directs a technical aspect of a project or program concerned with the design, development, and implementation of existing and/or proposed operational and/or support systems.

Typical duties:

Responsible for the technical direction of project or program activities, but may not be required to supervise others permanently and administratively. Directs project/program by planning, organizing, and coordinating the development and implementation of new or ongoing technical activities; assigns specific work objectives; may supervise others.

Comments:

Usually in charge of a specific functional or operational area, or a section of the total project, especially in large programming projects. Average experience exceeds eight years.

POSITION VIII:

Responsible for supervising and providing over-all technical guidance to a project or program staff concerned with the design and/or development, integration, and implementation of existing and/or proposed operational and/or support systems; may participate in technical and administrative planning for his corporate organization, and may represent his Division/Department Manager as a corporate spokesman in matters relative to project or program commitments. Organizes, establishes the objectives for, and defines the over-all work efforts of the project/program staff; insures that on-going activities conform with predetermined objectives and/or contractual requirements and complement the functions of departmental branches.

Comments:

This level of management will have at least one Position VII on their staff, and will normally be more experienced than Position VII. Also, this position requires the capability of providing frequent and effective technical direction on the most complex activities. Generally, managers will become highly involved in the development of new concepts and interdisciplinary technological applications covering a wide scope of operations.

Attachment 2 - Error Categories

The error categories contained in this attachment have been obtained with slight modification from RADC document Appendix 60-Error Categories, Specification No. CP 07877-96100A dated 1 April 1976. The use of this attachment allows a very fine categorization of error types. It is offered as an alternative to the simplified, gross error categorization approach offered in the two preceding data collection groups. The objective of defining error categories as a separate attachment allows for redefinition of the errors and/or categories as the utility and effect-tiveness of the categorization scheme becomes known.

ATTACHMENT 2-ERROR CATEGORIES

COMPUTATIONAL ERRORS

Total number of entries computed incorrectly
Physical or logical entry number computed incorrectly
Index computation error
Wrong equation or convention used
Mathematical modeling problem
Results of arithmetic calculation inaccurate/not as expected
Mixed mode arithmetic error
Time calculation error
Time conversion error
Time truncation/rounding error
Sign convention error
Units conversion error
Vector calculation error
Calculation fails to converge
Quantization/truncation error

CONFIGURATION ERRORS

Compilation error
Segmentation problem
Illegal instruction
Unexplainable program halt

DATA BASE INTERFACE ERRORS

Routine/data base incompatibility Uncoordinated use of data elements by more than one user

DATA HANDLING ERRORS

Valid input data improperly set/used

Data written in or read from wrong disk location

Data lost/not stored

Data, index, or flag not set or set/initialized incorrectly

Number of entries set incorrectly

DATA HANDLING ERRORS (cont'd)

Data, index, or flag modified or updated incorrectly Number of entries updated incorrectly Extraneous entries generated (table, array, etc.) Bit manipulation error Error using bit modifier Floating point/integer conversion error Internal variable error (definition or set/use) Data packing/unpacking error Routine looking for data in non-existent record Bounds violation Data chaining error Data overflow or overflow processing error Read error All available data not read Long literal processing error Sort error Overlay error Subscripting convention error Double buffering error

DOCUMENTATION ERRORS

Routine limitation
Operating procedures
Difference between flow chart and code
Tape format
Data card/operation request card format
Error message
Routine's functional description
Output format
Documentation not clear/not complete
Test case documentation

DOCUMENTATION ERRORS (cont'd)

Operating system documentation
Typo/editorial error/cosmetic change

GLOBAL VARIABLE/COMPOOL DEFINITION ERRORS

Items in wrong location (wrong data block)
Definition sequence error
Data definition error
Table definition incorrect
Length of definition incorrect
Comments error
Delete unneeded definitions

HARDWARE ERRORS

I/O ERRORS

Missing output
Output missing data entries
Error message not output
Error message garbled

Output of error message not compatible with design documentation (including garbled output)

Misleading or inaccurate error message text Output format error (including wrong location) Duplicate or excessive output

Output field size inadequate

Debug output problem (relative to design documentation)

Lack of debug output

Too much debug

Header output problem

Output tape format error

Output card format error

Error in print control

Line count/page eject error

I/O ERRORS (cont'd)
 Needed output not provided in design
 Insufficient output options

LOGIC ERRORS

Limit determination error Wrong logic branch taken Loop exited on wrong cycle Incomplete processing Endless loop during routine operation Missing logic or condition test Index not checked Flag or specific data value not tested Incorrect logic Sequence of activities wrong Filtering error Status check/propogation error Iteration step size incorrectly determined Logical code produced wrong results Logic on wrong routine Physical characteristics of problem to be solved, overlooked, or misunderstood Logic needlessly complex Inefficient logic Excessive logic Storage reference error (software problem)

OPERATING SYSTEM/SYSTEM SUPPORT SOFTWARE ERRORS
Compiler produces erroneous machine code
CS missing needed capability

OPERATOR ERROR

Test execution error

Routine compiled against wrong Compool/Master Common

Wrong data base used

Wrong master configuration used

Wrong tape(s) used

PRESET DATA BASE ERRORS

Data or operation request card descriptions
Error message text
Nominal, default, legal, max/min values
Physical constants and modeling parameters
Ephemeris parameters
Dictionary (bit string) parameters
Missing data base settings

QUESTIONS

Data base Master configuration Routine

RECURRENT ERRORS

Problem report reopened
Problem report a duplicate of previous report

REQUIREMENTS COMPLIANCE ERRORS

Excessive run time
Required capability overlooked or not delivered at time of report

ROUTINE/ROUTINE INTERFACE ERRORS

Routine passing incorrect amount of data (insufficient or too much)
Routine passing wrong parameters or units

ROUTINE/ROUTINE INTERFACE ERRORS (cont'd)

Routine expecting wrong parameters
Routine fails to use available data
Routine sensitive to input data order
Calling sequence or routine/routine initialization error
Routines communicating through wrong data block
Routine used outside design limitation
Routine won't load (routine incompatibility)
Routine overflows core when loaded

ROUTINE/SYSTEM SOFTWARE INTERFACE ERRORS

OS interface error (calling sequence or initialization)
Routine uses existing system support software incorrectly
Routine uses sense/jump switch improperly

TAPE PROCESSING INTERFACE ERROR

Tape unit equipment check not made

Routine fails to read continuation tape

Routine fails to unload tape after completion

Erroneous input tape format

UNIDENTIFIED ERRORS

USER INTERFACE ERRORS

Operations request or data card/routine incompatibility
Multiple physical card/logical card processing error
Input data interpreted incorrectly by routine
Valid input data rejected or not used by routine
Input data rejected but used
Input data read but not used

USER INTERFACE ERRORS (cont'd)

Illegal input data accepted and processed

Legal input data processed micorrectly

Poor design in operator interface

Inadequate interrupt and restart capability

USER REQUESTED CHANGES - PRODUCT IMPROVEMENT

Simplified interface and/or convenience

New and/or enhanced functions

CPU

Disk

Tape

1/0

Core

Security

New hardware/OS capability

Instrumentation

Capacity

Data base management and integrity

External program interface

3. DATA BASE STRUCTURE

In order to support research studies on various software related subjects, the data base containing the data parameters must be organized in such a way as to allow flexibility in access and retrieval of the data. The structure of the data base has been designed by grouping data items in records by considering both the topic the data relates to and the likelihood that the group of items contained in a record would be present as a unit from a single project. Therefore, the information from one form appears in one record, as well as data values that may be calculated from a combination of inputs from that form. When a form is not used for a given project, the data record will be omitted from the data base for that project.

The data base structure as presented in the following record schematics has been organized by examination of input requirements only. That is, the retrieval requirements may impact the data base structure, but have not been considered as they are not within the statement of work of this study. Also, some parameters that may be obtained by calculations from inputs are included in the record structure and are so designated. However, the methodology for obtaining these values is left to RADC. It is recommended that calculated values be obtained automatically, subsequent to automatic input editing of the data collection forms. Therefore, the volume of calculated values RADC incorporates in the data base will directly impact the software requirements. For example, the Identifiers of Higher Level Products and the Identifiers of Products on this Level can be calculated by use of an algorithm that examines the entire hierarchical structure of the project's products. Providing that this data is necessary to RADC needs, each project's system structure can be obtained automatically, reducing the data collection requirements placed on participating projects. In a similar manner, total resource expenditures can be maintained by organization, work element, and product identifier or any combination of these reporting elements, depending on both the project's bookkeeping policies and RADC needs.

The data base design presented is a structure to be used for the central repository. Examination of the techniques for sampling and filtering of data, or the structure of project data bases is not within the scope of this study.

3.1 RECORD TYPES

F-V

Each record type to be generated and updated by the manual collection of data forms is described in this section. The record type is named, followed by information about each data parameter within the specific record type. The following conventions are used to describe record types:

RECORD TYPE - Name of record

PARAMETER - Name of data items contained within the record.

REPEAT - An asterisk indicates that a data item, or following group of data items, is a repeating element (i.e., a list of parameters) in a single record. A group of data items are given a generic name and are indented under that name.

 E/A

 An asterisk indicates that two fields must be reserved for the data item in order to hold both the estimated and actual

values.
Indication of the type of field length, where:

F = fixed length alphanumeric V = variable length alphanumeric

LENGTH - The recommended length of the field, where

n = length of a fixed field or the maximum length of a variable field in characters.

n.n = total number of numeric characters and total number of decimal positions.

VALUES

 This field may contain: 1. a list of the valid values; 2. the units for a number; 3. the range of values allowed for a number;
 indication that the parameter value is calculated from inputs.

The notation of the asterisk beside the parameter's name indicates the key or combination of keys needed to access the data. The access paths or record linkage is further described in Section 3.2. The recommended record types follow.

RECORD TYPE: Project E	Environment	int			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ш	9	(yymudd)
Project Identifier*			ш	80	
Title			ш	16	
Description			>	256	
Start Date			L	9	(yymmdd)
End Date		×	ч	9	(yymudd)
Control Authority			ш	10	SPO, CCB, etc.
Number of Subcontractors		×	щ	4	
Total Manpower		×	ш	80	(man years)
Total Pages of Documen- tation		×	ц	80	
Total Number Program Modules		×	L	œ	
Total Number Subsystems		×	щ	8	
Total Number Operational Source Statements		×	ш	∞	
Total Number Support Source Statements		×	ш	œ	
Total Number Operational Object Instructions		×	ıL	∞	
Total Number Support Object Instructions		×	ш	∞	
Total Number Bytes in Data Base		×	L	∞	
Overall Project Complex- ity		×	ш	2	1-10

ware X F-V LENGTH g System X F 2 ools/ X F 2 ure X F 2 ure X F 2 v X F 2 ctive- X F 2 d X F 2 view X F 2 Type X F 7.1	RECORD TYPE: Project Environment (cont'd)	vironmen	t (con	t'd)		
ma	PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
ms	Application Software Complexity		×	Щ	2	1-10
MS	Control/Operating System Complexity		×	L	2	1-10
ONS X	Support System/Tools/ Aids Complexity		×	ц	2	1-10
MS X X X X X X X X X X X X X X X X X X X	Data Base Structure Complexity		×	LL	2	1-10
ONS X X X X X X X X X X X X X X X X X X X	Quality of Requirement Specifications			ш	2	1-10
ONS X X X X X X X X X X X X X X X X X X X	Quality of Design Specifications		×	u.	2	1-10
Mo x x x x x x x x x x x x x x x x x x x	Schedule Adequacy		×	ш	2	1-10
fications	Overall Project Management Effective- ness		×	ட	2	1-10
d X F 2 2 4 Yiew X F F 2 2 X Ype X F F 7.1	Overall Project Personnel Qualifications		×	L.	2	1-10
d X F 2 view X F 2 X F 12 Type X F 7.1	Computer Resources Adequacy		×	L	2	1-10
x F 2 X Y F 12 X X F 7.1	Customer Supplied Information		×	ıL	2	1-10
Type X F 7.1	Timeliness of Review Actions		×	ш	2	1-10
Type F 12	Funding Adequacy		×	ı	2	1-10
X F 7.1	Project Software Type			L	12	Business, Scientific, Systems, Maintenance, Other
	Project Duration		×	F	7.1	(calculated from inputs; months)

RECORD TYPE: Contract/Customer	tomer				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			L	9	(ppunukk)
Project Identifier*			ш	8	
Contract Type			Ŀ	5	FFP, FPE, FPI, COST, CS, CPIF, CPAF, CPFF, TME, LAB, IRAD,
Number Coordination Points		×	ட	4	
Frequency of Customer Contact		×	u.	4	D(daily), W(weekly), M(monthly), Y(yearly)
Customer Experience with Data Processing			щ	3.1	(years)
Customer Experience with Application			ட	3.1	(years)
Customer Experience with Target Computer			LL.	3.1	(years)
Customer Experience with			ட	3.1	(years)
Stringency of Review Procedures		×	щ	2	1-10
Reasonableness of Negotiations		×	L	2	1-10
Penalties for Non- Performance		×	L.	2	1-10
Technical Risk		×	L	2	1-10
Redirection Rate		×	L	2	1-10
Contract and Work Compatibility		×	ш	2	1-10
Contract Renegotiability		×	ш	2	1-10

RECORD TYPE: Contract/Customer	Customer	(cont'd)	(P.		
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Customer Turnover		×	4	4	% per year
Customer Rapport		×	L.	2	1-10
Project Location		×	ц	2	1-10
Quality of Physical Facility		×	ш	2	1-10
200 1000 1000 1000 1000 1000 1000 1000					
DE N. ADMINISTRAÇÃO DE SECURIO NO CONTRACTOR DE SECURIO					
			-		
			1		

RECORD TYPE: Software Installation	ıstallat	ion			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ш	9	(ppumukk)
Project Identifier*			L	80	
Location of Target * Computer			L.	9	TEST, FIELD, MULTI
Installation Technique		×	щ	80	PARALLEL, SWITCH, BACKUP
Number Personnel in Installation Team		×	L.	4	
Average Experience of Installation Team		×	Щ	4	(months)
On-Site Training		×	ш	10	NONE, MANUAL, BRIEF, LECTURE, EXERCISE
Software Adaptation		×	L	4	(%)
Resource Requirements for Installation		×	LL.	80	(dollars)
Installaction Difficulty Rating		×	ш	2	1-10
Problem(s) Description			>	256	
				8	

RECORD TYPE: Subcontractor	or				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			L	9	(yymmdd)
Project Identifier *			L	80	
Subcontractor Identifier			ш	∞	
Subcontractor Type			ш	10	
Kesponsibilities			>	526	
Experience in Data Processing			L.	3.1	(years)
Experience with Sub- contractor			L.	3.1	(years)
Experience with Applica- tion			ш	3.1	(years)
Frequency of Contact		×	u.	4	<pre>D(daily), W(weekly), M(monthly), Y(yearly)</pre>
Subcontractor Supplied Information		×	ш	2	1-10
Subcontractor Rapport		×	LL.	2	1-10

RECORD TYPE: Organizat	tion				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ш	9	(ppumukk)
Project Identifier*			ч	80	
Organization Identifier *			ш	80	
Organization Type			щ	10	LINE, MATRIX/PM, MATRIX/P, PROJECT, PROJ/CPT, OTHER
Organization Responsi- bilities			>	256	Meant)
Identifiers of Reporting Organizations	*	×	ш	œ	(Namus)
Work Identifier		×	L	80	
Initiation Date		×	L	9	(yymmdd)
Completion Date		×	L	9	(yymmdd)
Personnel Skill Level(s)	*	×	L.	2	1, 2, 3, 4, 5, 6, 7, 8
Manning Number		×	ц	4	
Managerial Techniques Identifier(s)	*	×	ш	20	
Managerial Turnover Rate		×	L.	4	
Key Personnel Turnover Rate		×	ட	4	
Project Member Turnover Rate		×	L.	4	
Identifiers of Higher- Level Organizations	*		ш	œ	(calculated from inputs)
Identifiers of Organiza- tions on this Level	*		L	œ	(calculated from inputs)
Average Project Member Turnover Rate	*		ч	4	(calculated from inputs)

Date of Submittal Project Identifier* Employee Identifier* Employee Skill Level Employee Job Title Organization Identifier Experience in Data Processing Experience with Project Programming Language Experience in Applica- tion Area Experience in Manage- ment Experience with Target Experience with Target Experience with Target	F-V LE	LENGTH	NAL IITC
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×	L.	2	
×	ш	50	
	ш	8	
	ш	3.1	(years)
	L	3.1	(years)
	ш	3.1	(years
	L	3.1	(years)
	ш	3.1	(years)
Education Level	L.	3.1	(years)
Personnel's Work * X F Identifier(s)	L	∞	
Experience on Project	L.	е	(months; calculated from inputs)
TARTER CARREST			

RECORD TYPE: Computer Equipment	uipment				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ц.	9	(yymmdd)
Project Identifier*			ıL	8	
Device Identifier *			ш	24	
Memory Size			ш	10	(k)
Unit of Measure			ш	10	BIT, BYTE, WORD
Number of CPU's			щ	4	
Number of I/O Channels			L.	4	
Memory Cycle Time			L.	8	
Unit of Measure			ıL	2	NANO, MICRO, SEC
Device Type			ıL	7	MINI, MICRO, MIDI, MAXI, SPECIAL
Number Sequential Access Devices			L	9	
Number Random Access Devices			L.	9	
Major Input Device Type			L	10	CARD, PAPER TAPE, TERMINAL
Product Identifiers	*		ш	8	
		la la			

RECORD TYPE: Computer Support Facilities	ipport Fa	ciliti	es		
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ь	9	(yymudd)
Project Identifier*			щ	8	
Location of Facility		×	щ	91	CENTRAL, TELEPROCESSING, COURIER, TRAVEL, DEDICATED
Mode of Operation		×	щ	91	BATCH, BATCH-RJE, INTERACTIVE, MIXED, DIRECT
Turnaround Time		×	щ	3.1	(hours)
Computer Availability		×	щ	3.1	(hours)
Quality of Equipment and/or Related Services		×	L	2	1-10
Quality of Operating System and Support Software		×	ш	2	1-10
Quality of Operating System and Support Software Documentation		×	LL.	2	1-10
Device Identifier*			L	24	
signasio OVI to session			4		
CONTROL CONTROL TIME					
Sangara a and there					
Tuga nona Senatas			4		
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BECORD INSTITUTED					

RECORD TYPE: Program Methodology	hodology				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ш	9	(yymmdd)
Project Identifier*			Ŀ	8	
Technique Identifier*	*	×	ш	50	
Technique Class(es)		×	L	24	ANALYSIS, DESIGN, IMPLEMENTATION, MANAGEMENT, QUALITY ASSURANCE, NOTATIONAL MECHANISM
Technique Type		×	ட	2	C(conceptual), M(manual), A(automatic), X(mixed)
Acquisition Cost		×	ட	8	(dollars)
Operation Cost		×	ഥ	8	(dollars)
Training Effort		×	L	4	(man-days)
Independence Rating		×	L	2	1-10
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RECORD TYPE: Programming Language	ig Langu	age			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			4	9	(yymmdd)
Project Identifier*			LL.	8	
Source/Object Language* Identifier			ш	12	
Language Acquisition Costs		×	L	∞	(dollars)
Language Training Costs		×	L.	80	(dollars)
Compiler/Assembler Reliability		×	L.	2	1-10
Language Documentation		×	LL.	2	1-10
Language Efficiency		×	Ŀ	2	1-10
Language Relevance to Project Goals		×	ட	2	1-10
Language Support Tools		×	ш	24	INTERFACE CHECKER, CROSS REFERENCE ANALYZER, PROGRAM INSTRUMENTER, TEST CONTROL MONITOR, DEBUGGING INTERPRETER, TEST DATA GENERATOR, TEST DATA REDUCER, MACRO PREPROCESSOR REFORMATTER, STANDARDS AUDITOR, STRUCTURED PROGRAMMING AUDITOR, OTHER

RECORD TYPE: Program P	Production Library	in Libr	ary		
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			щ	9	(yymmdd)
Project Identifier*			LL.	80	
PPL Identifier*			ų.	80	
Mode of Operation		×	L.	80	AUTO, MANUAL, MIXED
Manpower Resource Allo- cation		×	L.	œ	(man-months)
Skill Level		×	ட	2	1-8
Cost of Establishing PPL		×	L.	8	(dollars)
PPL Operation and Main- tenance Cost		×	L.	œ	(dollars
PPL Computer Utilization Costs		×	ш	œ	(dollars)
PPL Effectivity Rating		×	L	2	1-10
					(Shampe)
1979 - 1970				30	
Contract of Contra					
SECOND LINE					
		1	1		

REPEAT E/A F-V LENGTH F 6 F 8 F 8 F 8 F 6 F 6 F 12	RECORD TYPE: Work Definition	ition				
mg * * * * * * * * * * * * * * * * * * *		REPEAT	E/A	F-V	LENGTH	VALUES
ng * * * * * * * * * * * * * * * * * * *	Date of Submittal			ч	9	(ppwwkk)
mg	Project Identifier*			ь	œ	
mg * * * * * * * * * * * * * * * * * * *	Work Level			L	80	PROJECT, PHASE, TASK, ACTIVITY
* * * * * * * * * * * * * * * * * * *	Work Identifier*			L	8	
The state of the s	Work Description			>	256	
* * * * * * * * * * * * * * * * * * *	Identifiers of Reporting Work Elements	*		ட	œ	
* * * * * * * * *	Initiation Date			ш	9	(ppwwkk)
* * * * * * * * * * * * * * * * * * *	Completion Date			4	9	(ppwwkx)
* * * * * * *	Terminator			ш	12	
* * * *	Resource Utilization Data:	*				
* * *	Resource Identifier			L	12	
* * *	Resource Unit	N.		ш	10	MANHOURS, MANDAYS, HOURS, MINUTES, etc.
* * * *	Resource Allocated			ц	8	
* * * *	Resource Expended			щ	8	
* * *	Resource Variance			L	8	(calculated from inputs)
* *	Work/Product Identi- fiers	*		L	50	(calculated from inputs)
*	Identifiers of Higher- Level Work Elements	*		L	80	(calculated from inputs)
	Identifiers of Work Elements on this Level	*		ц.	8	(calculated from inputs)

RECORD TYPE: Work Definition (cont'd)	tion (c	cont'd)			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Product Identifier(s)	*		ட	12	
Work Duration	*		ш	8	(months; calculated from inputs)
				16	
TOTAL SECTION SECTIONS					
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RECORD TYPE: Product Identification	lentifica	tion			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			L	9	(yymmdd)
Project Identifier*			L.	80	
Product Identifier *			L	8	
Product Mod Number *			Ŀ	2	
Product Version Number *			ш	2	
Product Type			ш	12	DOCUMENT, PROGRAM, DATA, TEST, SERVICES, OTHER
Reporting Level			L	6	MODULE, SUBSYSTEM, SYSTEM
Product Description			7.	526	
Identifiers of Product Components	*	×	<u> </u>	∞	
Work Unit			L	10	LINES, PAGES, RECORDS, MANHOURS, etc.
Size		×	L	8	
Cost		×	ŭ.	8	(dollars)
Programming Language Identifier		×	ъ	12	
Language Relevance to Product		×	ъ-	2	1-10
Language Efficiency for Product		×	ட	2	1-10
Product Complexity		×	ı	2	1-10
Product Familiarity		×	Ŀ	2	1-10
Product Stability		×	ш	2	1-10

1					
KECUKU IYPE: Product Identification (cont.d)	Jentifica	nota	cont		
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Programming Techniques Data:	*		•		
Technique Identifier		×	ш	50	1-10
Relevance to Product		×	ıL	2	1-10
Integration Rating		×	L.	2	1-10
Identifiers of Higher Level Products	*		L	12	(calculated from inputs)
Identifiers of Products on this Level	*		L	12	(calculated from inputs)
STATE OF THE CASE OF THE STATE					
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RECORD TYPE: Project Performance	formanc	ď			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			L	9	(yymmdd)
Project Identifier*			L.	80	
Organization Identifier*		******	L.	8	
Production Data:	*				
Work Identifier *			L	8	
Product Identifier*		* ****	ч	80	
Resource Identifier		*** 1 % ***	ш	12	PERSONNEL, TRAVEL, COMPUTER, etc.
Resource Units Expended			ц	10	
Work Units Produced			ட	10	
Product Status			L.	10	STARTED, CONTINUING, COMPLETED, MILESTONE
Work Units Discarded			L	10	(calculated from inputs)
Beautiful Color States				2	
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Technique Tigné Hiler			4	9	
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PARAMETERS REPEAT E/A F-V LENGTH VALUES Date of Submittal F 6 (xymmdd) Project Identifier* F 8 (ECPxxxxx, SPRxxxxx, DRFxxxxx) SPR Identifier* F 8 (ECPxxxxx, SPRxxxxx, DRFxxxxx) SPR Identifier* F 8 (xymmdd) Date of Problem Discovery F 6 (xymmdd) Time of Day F 8 U(unit), I(integration), S(s) Progress Status F 8 U(unit), I(integration), S(s) Status F 8 U(unit), I(integration), S(s) S(s) Product(s) Impacted by * F 8 PNDING, OTHER Problem Date Base Identifier F 8 PNDING, OTHER Test Case Identifier F 8 PNDING, OTHER Problem Posteription V 256 Cyymmdd) Pate Received F 8 Cyymmdd Employee Assigned F 8 Cyymmdd	RECORD TYPE: Software Problem	oblem				
*		REPEAT	E/A	F-V	LENGTH	VALUES
* TTTTTTTTTTTTTT 8 8 2 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Date of Submittal			ц	9	(yymudd)
*	Project Identifier*			ıL	80	
*	SPR Identifier*			4	8	(ECPxxxxx, SPRxxxxx, DRFxxxxx)
*	SPR Type			L	2	FR, DC, MC, EF, ED, EC
*	Employee Identifier			L	80	
*	Date of Problem Discovery			щ	9	(yymmdd)
* * * * * * * * * * * * * * * * * * *	Time of Day			L.	4	(hhmm)
*	Work Identifier in Progress			щ	80	U(unit), I(integration), S(system), A(acceptance), O(site)
*	Status			L	8	OPEN, CLOSED, PENDING, OTHER
7 T T T T T T T T T T T T T T T T T T T	Product(s) Impacted by Problem	*		u.	œ	
F F F F F 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	Data Base Identifier			L	8	
8 6 25 8 8 6 25 8	Test Case Identifier			L	80	
V 256	Test Tool Identifier			L	80	
gned 8 6	Problem Description			>	526	
L.	Date Received			ш	9	(yymmdd)
	Employee Assigned			4	80	
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RECORD TYPE: Software	Modification	tion			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			ч	9	(ppumux)
Project Identifier *			L	80	
SMT Identifier*			L	80	(VDDxxxxx, SCNxxxxx, CRxxxxxx)
Date of Correction			L	9	(yymmdd)
Time of Day of Correction			4	4	(hhmm)
Employee Identifier			L.	8	
SPR's Resolved	*		L	8	
Product Identifier(s)	*		L	80	
Old Mod			ш	2	
New Mod			ш	2	
Unit of Change			L	10	LINES, PAGES, etc.
Amount of Change			ш	80	(+, -, /)
Difficulty Rating			L	2	1-10
Work Identifier			ш	80	
Type of Software Termination			L.	80	NORMAL, ABNORMAL
Work Identifier in Progress when Error Generated			L	œ	
Manpower Resource Data			ш	4	(manhours)
CPU Time			ш	4	(minutes)
Error Description			>	526	
Error Type			L	28	
Date Received			ш	9	(yymmdd)

RECORD TYPE: Software Operation Log	peration	Log			
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal		,	L	9	(yymmdd)
Project Identifier*			ш	80	
Device Identifier*			L	24	
Log Date	44		L		(yymmdd)
Job Identifier			Ŀ	8	
Computer Job Acceptance Time			L.	01	(mmddhhmmss)
Computer Operations	*		L	24	
Completion Code			ш	4	
CPU Time			L	9	(mmss)
Cumulative CPU Time			L	10	(calculated from inputs)
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RECORD TYPE: Job Identification	fication				
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal			L	9	(yymmdd)
Project Identifier *			L	8	
Job Identifier*			L	8	
Employee Identifier			L.	8	
Test Case Identifier			L	8	
Product Identifier(s)	*		Ŀ	8	
Technique/Tool Identifier(s)	*		ш.	50	
Description			>	526	
				9	
Completion Code in the					
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RECORD TYPE: Milestone				12.80	76
PARAMETERS	REPEAT	E/A	F-V	LENGTH	VALUES
Date of Submittal		×	ш	9	(ppumukk)
Project Identifier*			u.	80	
Milestone Identifier*			щ	80	
Work Identifier*			ш	80	
Date of Event		×	L.	9	(ppwwdd)
Milestone Type			L.	91	REVIEW, DELIVERY, TEST, OTHER
Milestone Status			ш	80	PENDING, COMPLETE, OPEN
Milestone Description			>	526	
Milestone Subevents:	*				
Work Identifier(s)		×	ш	8	
Product Identifier		×	ш	80	
Product Status		×	u.	50	(COMPLETE, PENDING, ETC.)
Product Identifier(s) Baselined		×	L	œ	
SPR(s) Established	*		L	80	
Authentication			>	100	
	4		ne de	eni Se e	
			bee		

3.2 RECORD LINKAGE

As was noted in the record type layouts in Section 3.1, each record type has the key field or fields indicated by an asterisk. The key field contains the unique identifier of a record, and is used to access the record. The records are designed to be stored serially on disk or tape, and accessed through an index which contains the key fields and relative record locations. At least one index will exist for each record type to access all records of the type. When two keys fields are included in a record, the primary key field is used for the complete index. Other indices may exist to index subsets of the records. The subsets are based on the relationship to another record, such as all subcontractors working on a project. In this case, the project record then becomes a set owner which then owns a set of subcontractor records called the members.

A given record may belong to several sets and may own several sets. All set relationships are established in the data base structures as depicted in the diagrams that follow. These diagrams show the data base structure at the physical data base level. As previously noted, one user may not need to access the complete data base. For this reason, logical views which encompass only some of the records and relationships are also needed. These logical data bases depend upon the use of the data base and are not within the scope of this study.

Owner and member records may be linked together in single or multiple relationship through keys and indices. In the following set of physical data base diagrams, the boxes represent record types. Arrows depict the relationship of the owner to the member record types. A single, or one to one relationship, is indicated by the notation "1:1"; a multiple, or one to many, relationship is indicated by "1:M". In some cases, the record types have a dual relationship, with each participating as an owner and a member. This is represented by two arrows.

A single, or one to one, relationships is the simplest type. The owner record contains the key of the member record as a field within the owner. The member key may also be a subset of the owner key. For example, a

testcase record owns a testresults record which uses the tests case identifier as its key. This combination could actually be one record, but is designed as two records because testcases may exist without testresults.

Multiple, or many to many, relationships may be implemented in several of the following ways:

- a. The owner record may contain a pointer to an index which contains a list of member keys and the relative record address.
- b. The owner record may contain a partial key also called a generic key. The partial key includes the part of the key which is common to all members. For example, product uses a product identifier, version, and mod as the key. If all versions and mods of the product are desired, the owner record would contain a single product I.D. but could access multiple member records.
- c. The owner record may contain keys of member records in a repeating set. If only the key repeats, an index would be used. However, when there is some other information specific to the conjunction of the two records, the key and other information appear in a repeating group.
- d. Records may be linked to other records of the same type in a tree structure. This is done for product and work elements. Each record contains keys of the higher level record, the next on the current level, and the lower record.

The following schematics depict access paths for data records for all systems. Note that the access paths for data generated automatically by software utility programs are also included, although the type, use, method of data generation and acquisition are not known at this time. For example, the use of a tool (or models) for comparison of programming languages will generate data on core size, run time, debugging costs, construct usage etc. The data generated by this type of tool can be linked to a project's specific

use of the language since the project has defined its languages. An access path from the project's language to the data record generated by the tool is possible when the record relationships and keys are defined.

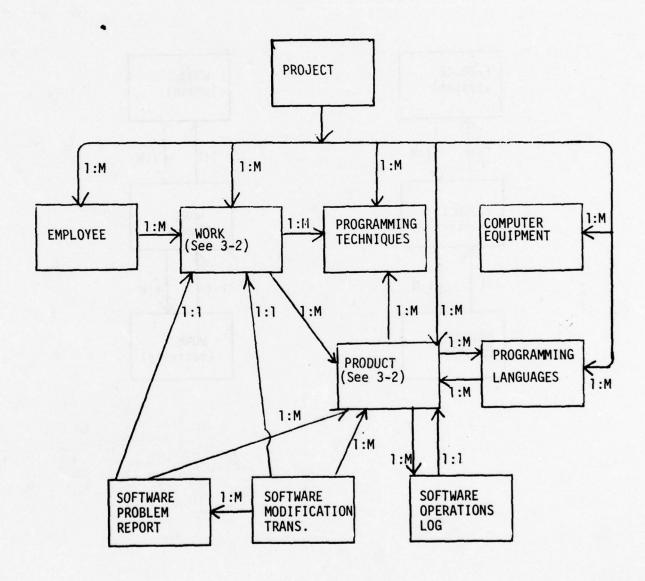


Figure 3-1. Small Data Wolume System Overview of Access Paths

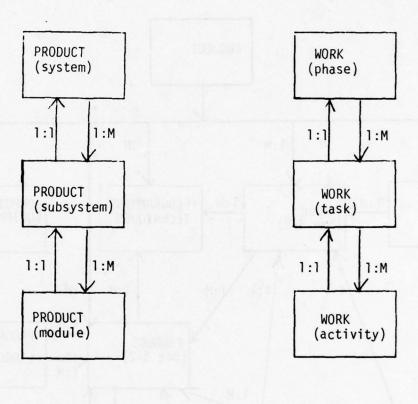


Figure 3-2. Small Data Volume System Product, Work Structure.

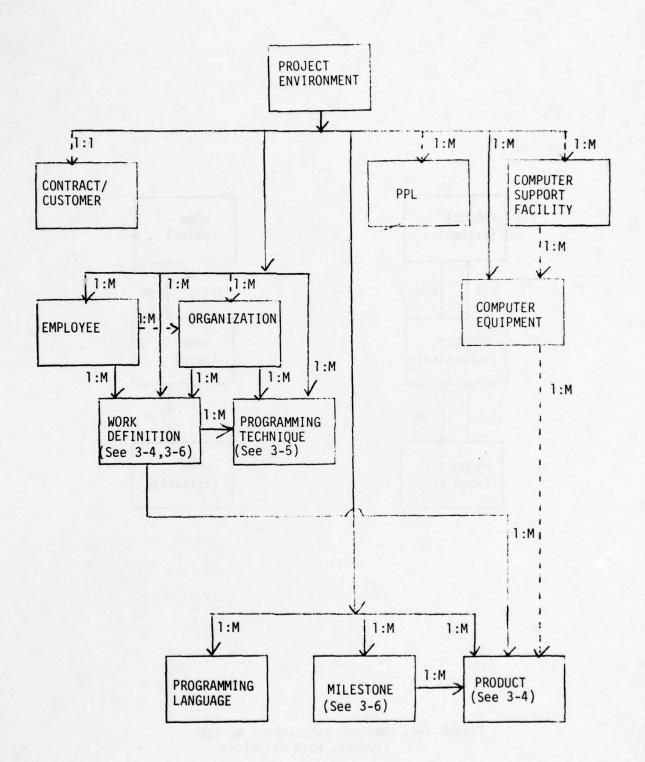
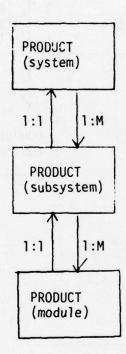


Figure 3-3. Medium Data Volume System Overview of Access Paths.



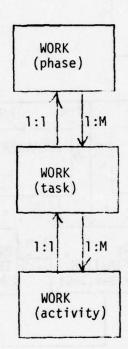
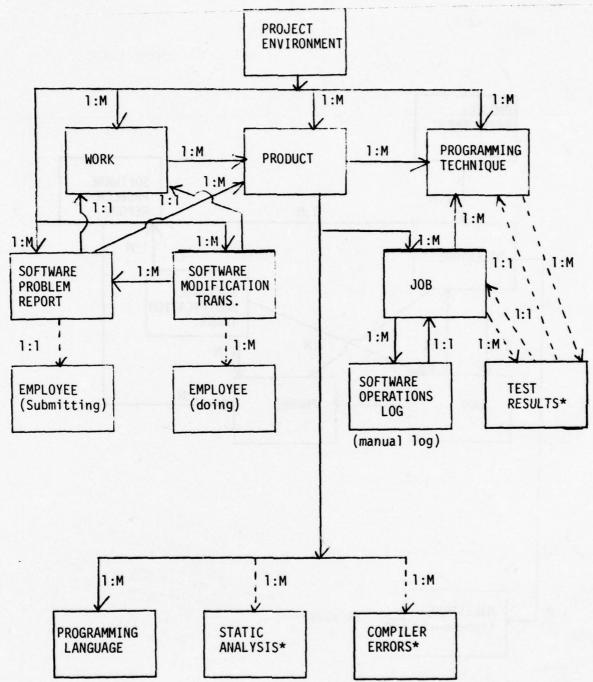


Figure 3-4. Medium Data Volume System Product, Work Structure



*No forms are designed for these records; their presence and content depend upon automatic tools.

Figure 3-5. Medium Data Volume System Product Quality.

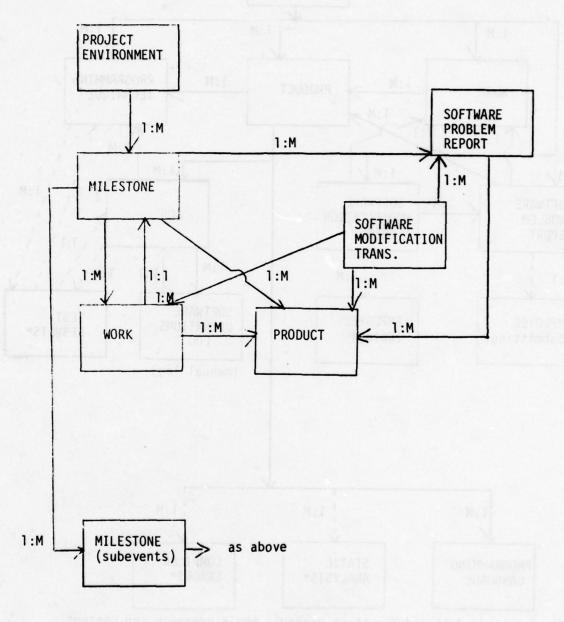


Figure 3-6. Medium Data Volume System Milestone Review

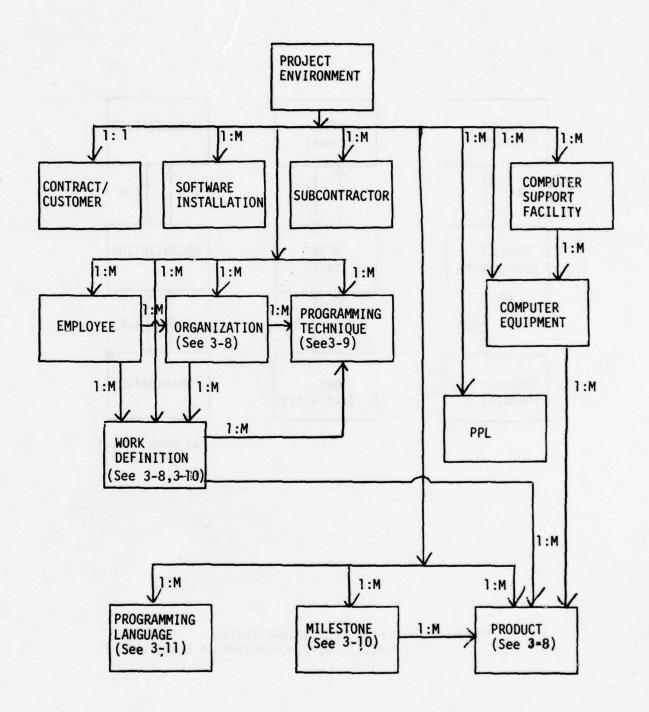


Figure 3-7 . Large Data Volume System Overview of Access Paths

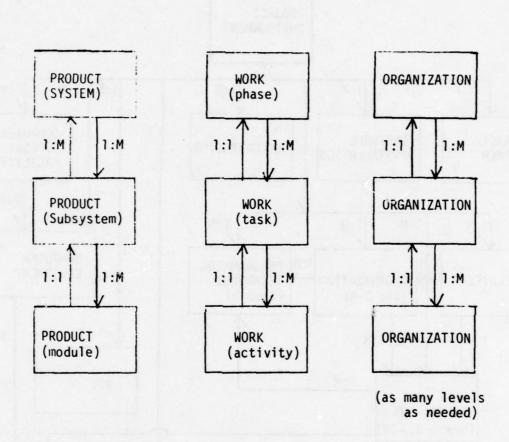
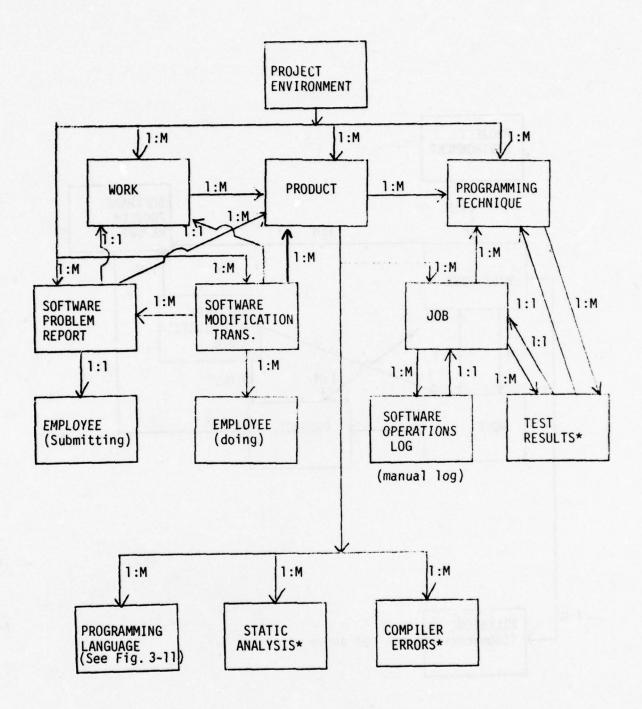


Figure 3-8. Large Data Volume System Product, Work, Organization Structure.



*No forms are designed for these records. Their presence and content depend upon automatic tools and methods used for obtaining data .

Figure 3-9. Large Data Volume System Product Quality

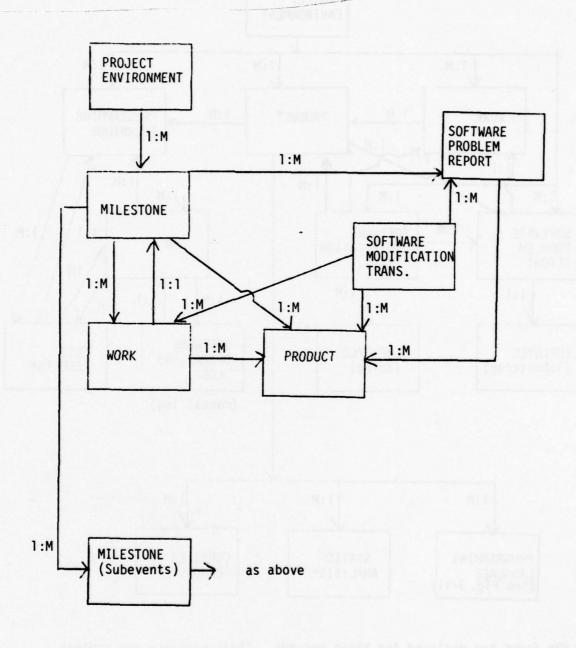
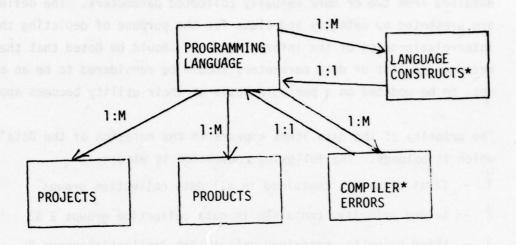


Figure 3-10. Large Data Volume System Milestone Review.



*No forms are designed for this record; the content depends upon the automatic tools and methods used for obtaining data.

Figure 3-11 Large Data Volume System Language Studies.

4. DATA PARAMETER DEFINITIONS

The data parameters necessary to support productivity, reliability and cost studies are defined below. The entire set of parameters include 1) manually collected data; 2) automatically collected data; 3) calculated values obtained from two or more manually collected parameters. The definitions are presented by category and class for the purpose of depicting the interrelationships of the information. It should be noted that the recommended list of data parameters should be considered to be an evolving set, to be updated on a periodic basis as their utility becomes apparent.

The priority of the data items appears in the notation of the Data Group to which it belongs. The following convention is used:

- 1 first priority, contained in all data collection groups.
- 2 second priority, contained in data collection groups 2 &3
- 3 third priority, contained only in data collection group 3.

The collection method for obtaining the data parameter is also included. The following convention is used:

- M Manual collection with specificity to the form provided to collect the data, e.g, P! indicates Form Pl Project Environment Information.
- A Automatic collection necessary.
- blank A calculated value, necessary to support research requirements but dependent on availability of software or other manual method needed to generate the value.

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COLLEC- TION METHOD	A										P8 = 61
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GROUP				7	-		_	-		~	2 4 十五日
 Project Attributes The category of data items that describe the customer and contractual conditions, 	operating milieu, available resources and overall structural and benavioral character- istics of the software.	A. Customer/Contract Identification Parameters-Information concerning the definition of the project, the contract characteristics, and customer data.	1. Project Definition. Information uniquely identifying this project, including:	a. Project Identifier - An acronym, number or other identifer that uniquely specifies a project.	b. Project Title - A short name or descriptive title for the project.	c. Project Description - A brief narrative description of the software development project, covering its objectives, scope and approach.	d. Project Start Date - Date project is initiated.	e. Project End Date - Data project is to terminate.	2. Contract Characteristics. Information concerning contract terms and conditions, including:	a. Contract Type - The types of contract under which the work is performed. Choices are:	FFP - Firm Fixed Price with Escalation FP-E - Fixed Price with Escalation FPI - Fixed Price Incentive FPI - Fixed Price Incentive Free COST - Cost with no fee CS - Cost shared with customer LABOR - Labor costs only

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COLLEC- TION METHOD	Z 4			~		21	01	
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GROUP	8		-	~	-	~	м	
estanting jaken johnen To see holombalan en jaken johnen ten en jaken ja	h. Customer Experience with Target Computer - Years of experience customer has had with the specific hardware equipment	4. Customer Configuration Control Procedures. Items describing the procedures for defining and baselining the software product and controlling changes to the baselined configuration, including:	 a. Control Authority - A descriptive word or phrase characterizing the nature of the customer's configuration control agency, e.g., SPO, CCB, project monitor, etc. 	b. Stringency of Review Procedures - An evalution of the customer's methods of approval and review of plans, specifications, and modification requests in terms of the severity or stringency of the procedures and the strictness with which they are observed.	c. <u>Timeliness of Review Actions</u> - An evaluation of the length of time it takes to process an item through the review and approval cycle, especially in terms of exceeding scheduled review periods and the priority, importance or immediacy of the need for a decision.	 d. Reasonableness of Negotiations - An evalation of the reasonableness of the review and inspection process, and in settling disagreements. 	e. <u>Penalties</u> - An evaluation of the stringency of penalties for non-compliance or due to disapproval of an item.	

		GROUP	TION	TION
Cust of c	Customer Stability. Information concerning the relative stability of customer personnel and other factors that might disturb the excellence of customer relations, including:		Σ	A
ė.	Customer Turnover - An evaluation of the rate at which members of the customer's control, monitor, and technical staff (contact points) are replaced.	m	P2	
	Redirection Rate - An evaluation of the frequency with which the project is redirected or given a new task to perform, or an existing task cancelled.	2	P2	
Over proj deve	Overall Contract Assessment. An evaluation of the likelihood that project goals will be met without undue penalty to customer or developer, including:		3	
ė.	Quality of Requirements - An evaluation of the clarity, completeness, implementability and verifiability of the project's requirements specification.	-	Б	
ė.	Technical Risk An evaluation of the feasibility of meeting technical performance requirements based on the familiarity and difficulty of the problem and available technical skills.	2	P2	
	Schedule Adequacy - An evaluation of the tightness of project scheduling in view of the size, difficulty and complexity of the project.	-	LA	
ė,	Funding Adequacy - An evaluation of the adequacy of project funds to meet the software deliverable end items.	-	Ы	
ů.	Convenience of Project Location - An evaluation of the place of project performance based on the estimated ease of manning, acquiring facilities, making travel accommodations, obtaining employee housing, and accessing the computer.	3	P2	F18

f. Quality of Physical Facility - An evaluation of the working environment for project personnel, based in part on the adequacy of the funding to provide for sufficient office space, amount and quality of equipment, and supplies. Subcontracting Characteristics. Information concerning the quality of work performed, effectiveness of interactions and relationships with the subcontractor software development project. B. Subcontractor Identifier - An acronym, number or other identifier that uniquely identifies the subcontractor. C. Subcontractor Identifier - An acronym, number or other identifier that uniquely identifies the subcontractor. C. Subcontractor Identifies - An acronym, number or other identifier that uniquely identifies the subcontractor. G. Subcontractor Identifies - An acronym, number or other identifier and or phrase identifying the type of service the subcontractor. Subcontractor. G. Subcontractor Fapport - An evaluation of the degree of rapport and understanding with the subcontractor (s) based on the relative frequency and number of conflicts and disagreements. G. Subcontractor Experience with DP - Years of experience the subcontractor is standing with the subcontractor. Years of interaction with this subcontractor experience with DP - Years of experience the subcontractor is supplied Information - An evaluation of the subcontractor is supplied Software items and/or equipment. J. Subcontractor Experience with Application - Number years experience in work of current nature.		_												
Quality of Physical Facility - An evaluation of the working environ- ment for project personnel, based in part on the adequacy of the funding to provide for sufficient office space, amount and quality of equip- ment, and supplies. becontracting Characteristics. Information concerning the quality of work rformed, effectiveness of interactions and relationships with the subcon- actor(s), including: Number of Contractors - Total number of subcontractors participating in software development project. Subcontractor Identifier - An acronym, number or other identifier that uniquely identifies the subcontractor. Subcontractor Interactor and or phrase identifying the type of service the subcontractor principally supplies. Subcontractor(s), seeponsibilities - Short description ov work perf- ormed by subcontractor. Subcontractor of Contact - The closeness of liason with the subcontractor, rated in terms of the average frequency of contact. Frequency of Contact - The closeness of interaction with this standing with the subcontractor - Years of interaction with this subcontractor. Subcontractor Experience with DP - Years of experience the subcontractor is subcontractor Supplied Information - An evaluation of the subcontractor Subcontractor Supplied Information - An evaluation of the subcontractor supplied software items and/or equipment. Experience with Application - Number years experience in work of	LEC-	A												
Quality of Physical Facility - An evaluation of the working environment for project personnel, based in part on the adequacy of the funding to provide for sufficient office space, amount and quality of equipment, and supplies. becontracting Characteristics. Information concerning the quality of work rformed, effectiveness of interactions and relationships with the subconsactor(s), including: Number of Contractors - Total number of subcontractors participating in software development project. Subcontractor Identifier - An acronym, number or other identifier that uniquely identifies the subcontractor. Subcontractor principally supplies. Subcontractor Rapport - An evaluation of the description ov work performed by subcontractor. Trequency of Contact - The closeness of liason with the subcontractor, rated in terms of the average frequency of contact. Subcontractor Rapport - An evaluation of the degree of rapport and understanding with the subcontractor(s) based on the relative frequency and number of conflicts and disagreements. Experience with Subcontractor - Years of interaction with this subcontractor supplied Information - An evaluation of the subcontractor has had in data processing. Subcontractor Supplied Information - An evaluation of the subcontractor supplied software items and/or equipment. Experience with Application - Number years experience in work of current nature.	COL MET 1	Σ	P2		Б	P4	P4	P4	P4	P4	P4	P4	P4	P4
Quality of Physical Facility - An evaluation of the working environment for project personnel, based in part on the adequacy of the funding to provide for sufficient office space, amount and quality of equipment, and supplies. becontracting Characteristics. Information concerning the quality of work rformed, effectiveness of interactions and relationships with the subconsactor(s), including: Number of Contractors - Total number of subcontractors participating in software development project. Subcontractor Identifier - An acronym, number or other identifier that uniquely identifies the subcontractor. Subcontractor principally supplies. Subcontractor Rapport - An evaluation of the description ov work performed by subcontractor. Trequency of Contact - The closeness of liason with the subcontractor, rated in terms of the average frequency of contact. Subcontractor Rapport - An evaluation of the degree of rapport and understanding with the subcontractor(s) based on the relative frequency and number of conflicts and disagreements. Experience with Subcontractor - Years of interaction with this subcontractor supplied Information - An evaluation of the subcontractor has had in data processing. Subcontractor Supplied Information - An evaluation of the subcontractor supplied software items and/or equipment. Experience with Application - Number years experience in work of current nature.	DATA		m		-	7	7	7	2		2	2	7	2
			Quality of Physical Facility ment for project personnel, to provide for sufficient orment, and supplies.	. Subcontracting Characteristics. Information concerning the quality of work performed, effectiveness of interactions and relationships with the subcontractor(s), including:	Number of software o		Subcontractor Type - A word or phrase the subcontractor principally supplies		Frequency of Contact - The closeness of liason with rated in terms of the average frequency of contact.			Subcontractor Experience with DP - Years of experience the has had in data processing.		

		DATA	COLLEC- TION METHOD
Sof tec inc	<u>Software Installation Parameters.</u> Data reflecting information about the techniques, personnel, resources and problems of software installation, including:		
ė	Location of Target Computer - The degree of dislocation between the development facility and the operational facility, Choices include: SAME - The software is developed on the machine it is to run on.	2	P3
	TEST - The software is delivered to or checked out in a test facility different than the developmental facility. FIELD - The software must be installed in an operational facility/located at some distance. MULTI - The software must be installed at several field location's or delivered to many users.		
6	<u>Software Adaptation</u> - The amount of change that must be done to adapt the software to run on the operational (target) computer, as an approximate in percent of code change.	2	P3
ပ	Installation Technique - The method used to integrate the new soft-ware into ongoing operations. Choices include:	2	P3
	PARALLEL - Both the old and the new system operate in parallel for a period. SWITCH - Operations are switched to the new system without recourse. BACKUP - The old system is retained as a fallback capability in case the new system fails.		
• /	Installation Team - Number of project personnel required to install the new software system on site.	2	P3
aj.	Experience of Installation Team - The average experience in number of months the installation team has with the software system and with the customer and site.	8	P3

Project Organization/Personnel Parameters. A description of the structure, GRC responsibilities, manning, and personnel assignments of the project.	GROUP	TION METHOD
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Organization Definition. Information identifying and describing organizational elements, including:	2	P5
Organization Type - A short word or phrase describing the inter- nal organization of the element. Sample choices are:		
LINE - A functionally specialized organization		
MATRIX/PM - Personnel in functionally specialized groups when coordinated by a Project Manager or PMO.		
MATRIX/P - Personnel from disciplinary or functionally specialized groups, assigned to a project for its duration and returned to the home group upon project termination.		
PROJECT - An organization formed to work on a specific project.	-	
PROJ/CPT - A specific internal project organization, utilizing a Chief Programmer Team.		
Organization Identifier - A short acronym or number that uniquely defines the organizational element.	2	P5
Organization Responsibilities - A brief description of the mission and responsibilities of the organization.	2	P5
Identifiers of Reporting Organizations - A list of the organizational elements that report to this one.	2	P5
<pre>Work Identifier - A name or number uniquely identifying this particular work clement, and for which manpower computer, etc., resources will be allocated.</pre>	2	P5

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	Personnel Characteristics - Items describing the individual characteristics of personnel assigned to the project, including:	a. Employee Identification - A name or number uniquely identifying the project member.	b. Personnel Skill Level - A short name or number designating the level of advancement or skill of the personnel within the organizational element.	c. Job Title - A short descriptive phase identifying the position filled by the employee in the organization, e.g., Section Head, Chief Programmer, PPL Librarian, etc.	 d. Organization Identifier - A short acronym or number that uniquely identifies the organizational element to which this employee is assigned. 	e. Experience - The number of years the employee has been engaged in the data processing field.	f. Experience with Target Computer - The number of years experience the employee has had with the target computer.	g. Experience with Programming Language - The number of years experience the employee has had with the programming language being used by the project.	h. Experience with Application - The number of years experience the employee has had with the specific data process application.	i. Project Experience - The number of months the employee has been assigned to this specific project. (Calculated from inputs.)	j. Education - The number of years of college the employee has acquired (30 semester hours = 1 year).

k. Management Experience - The number of years experience the employee has had in a position of management, or equivalent responsibility. 1. Personnel's Work Identifier - A name or number uniquely identifying the work element(s) to which the individual is assigned. 1. Overall Management/Personnel Assessment - An evaluation of the impacts project performance, including: 2. Overall Project Management Effectiveness - A rating of the management control of the project based on the stringency of administrative plans and configuration control procedures. 2. Overall Project Management, technical and administrative support people, in meeting the projects performance goals. 3. Sonnel including management, technical and administrative support
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COLLEC- TION METHOD	A											
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Hardware/Computer Support Facilities Parameters - Information concerning the power, availability, and adequacy of the computing equipment upon which, and for	which, the software is developed.	1. Computer Definition. Information identifying and describing the computer equipment and capabilities including:	a. Device Identifier - The name of the computing device employed, including the manufacturer of the equipment, the series number, and the model number.	b. Memory Size - The amount of information the computer memory can store and base, e.g., 64K.	c. Unit of Measure - The unit by which the storage capacity is measures, e.g., bit, byte, word.	d. Number of CPUs - The total number of central processing units associated with the identified computer.	e. Number of $I/0$ Channels - The number of hardware devices that connects the CPU and main storage with the $I/0$ control units.	f. Memory Cycle Time - CPU cycle or access time.	g. Unit of Measure - The unit by which cycle time is measured, e.g., nano-seconds, microseconds, seconds.	h. <u>Device Type</u> - The general classification of the computer equipment according to size.	Mini - A computer with a portable mainframe. Micro - A computer that is microprogrammable and is also portable Midi - A medium size computer, e.g., PDP!O, IBM 360/20-370/158. Maxi - A large scale computer capable of multiprocessing, e.g, CDC 7600, IBM 370/191. Special Purpose - Computer built to specific specifications for a	i. Number Sequential Access Devices - Number of devices providing secondary storage of sequential access type, e.g., tape drives.

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	J. sto	nber Kandom Aco	Number Kandom Access Devices - Number of devices providing secondary storage of random access type, e.g., discs, drums.	-	P7	
	k.	Major Input Device Type - percentage of input data.	ce Type - Type of input device that provides the major out data. Choices include:	-	P7	
	Card Paper Termi	. Tape	- Punched cards - Punched tape - Remote site input			
	1. Pre	Product Identifie ware device. (Ne	dentifiers - Identifiers of product elements using this hard-ce. (Needed only when more than one device is used by project.)	_	P7	
2.	Project mation a and expe	Computer Utili bout the compu	Project Computer Utilization Parameters. Parameters reflecting information about the computer utilization and support facilities as projected and experienced by the project, including:			
	a. Tur	naround Time a job to the c	Turnaround Time - The average length of time between the submittal of a job to the computing facility and its return to the requestor.	2	P8	
	b. Ava	Availability - Th	Availability - The average number of hours per day the equipment is available for developmental use.	2	P8	
	c. Moc	de of Operation	Mode of Operation - The names of interacting with the device or facility, such as BATCH, BATCH-RJE, INTERACTIVE, MIXED, DIRECT.	2	P8	
	d. Loc fac inc	Location of Compu facility, equipme include:	of Computing Center - The accessibility of the computing equipment and personnel, to the individual user. Choices	~	P8	
	Dec	Dedicated Central	Equipment "owned" and operated by the project. Equipment immediately available but owned by the overall organization and shared with other projects.	V.	- 5	
	Tel	Teleprocessing -	Equipment distanctly located but available through a TSS or RJE network.			
	Cor	Courier -	Equipment distantly located and available through courier service only.			
	Tra	Travel -	Equipment distantly located and accessed only by	•		

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ė	Operating System/Support Tools Documentation Rating - An evaluation of the availability and clarity of the documentation supporting the use of the operating system, test and utility tools.	2	P8	
4	Quality of Equipment and/or Related Services - An evaluation of the quality of computing equipment and services rendered to the project, with respect to type of services offered, amount of down time of the equipment, etc.	2	P8	
6	Quality of Operating System and Support Software - An evaluation of the software associated with the computing equipment with respect to the options offered, e.g., multiprogramming control services, data management capabilities, scheduling and dispatching options, languages supported, error recovery options, etc.	2	88	
ė	Device Identifier - The name of the computing service described, including the manufacturer of the equipment, the series number, and the model number. (This field may be omitted if a single computer facility is used.)	2	P8	
Ove tha ass	Overall Hardware Environment/Computer Facilities Assessment. An evaluation that project requirements will be met by the hardware environment, and an assessment of the impact on services rendered by the software installation including:			
e e	Computer Resources Adequacy - A gross rating of the computer resources to meet the requirements of the project.	-	2	

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	 Support System/Tools/Aids Complexity - A rating of the complexity in the use, interactions and or documentation of the support software. 	d. Data Base Construction Complexity - A rating of the complexity of the data base structure, dependent an factors to be delivered.	e. Project Complexity - A gross rating of the degree of complexity of the project, independent from the complexity of the software produced. (This evalution should consider such factors as the number of coordination points, number of subcontractors, number of agencies per product, number of internal coordination points, number disciplines involved, number and variety of products produced, number and variety of products produced,	3. Project Size. An estimation of project size based on the amount of deliverable code, including:	a. Total Source Language Statements in Operational Software - The number of deliverable POL statements in the operational system.	b. Total Object Language Instructions in Operational Software - The number of deliverable MOL statements in the operational system.	c. Total Source Language Statements in Support Software - The number of POL statements in the support software.	d. Total Object Language Instructions in Support Software - The number deliverable MOL statements in the support software.	e. <u>Data Base Size</u> - An estimation of the number of bytes of storage required for data storage.	f. Total Manpower - An estimation of the number of manyears required for the software project.	 g. Project Duration - An estimation of the total elapsed time required to perform the project. (Calculated from inputs.)

documentation - An estimation of the total number of documentation to be produced during the performance of the
Total Number of Modules - An estimation of the total number of modules to be produced during the performance of the project.
<u>Number of Subsystems</u> - An estimation of the total number of sub-systems to be produced for the software system.
Programming Methodology - Information on the programming techniques used during the development process, including:
Technique Identifier - A short descriptive title of the technique. Technique Class - Identification by class of the techniques used by project personnel. Classes include:
Analysis Techniques - A short unique title for the techniques used in the analysis phase of software development. Example choices include modeling, simulation, trade-off studies.
Design Techniques - A short unique title for the techniques used in the design phase of software development. Example choices include top-down, modeling, proofs of correctness, informal design, bottom-up, hierarchical structure, modularity.
Implementation Techniques - A short unique title for the techniques used in the implementation phase of software development. Example choices include modularity, restricting control flow, programming standards, bottom-up, proofs of correctness, program production library.
Management Techniques - A short unique title for the techniques used in managing the software project directly supporting program production. Example choices include chief programmer teams, configuration management, program production library, build approach.

	GROUP	TION
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Quality Assurance Techniques - A short unique title for the techniques used by the project to assure software quality. Example choices include static test tools, dynamic test tools, test teams, top-down testing, bottom up testing, program production libraries, formal design walk thru.		
Notational Mechanisms - A short descriptive title for the mechanisms used in documenting the previously mentioned developmental techniques. Example choices include HIPO, programmer's notebook, decision tables, flowcharts.		
Technique Type - An indication of whether the methodology is a conceptual, manual, automatic, or mixed.	-	6d
Technique Independence - The degree to which this technique stands alone, that is, can be used independently of a particular machine, operating system, language, application, or other constraint.	-	6d
Training Effort - An estimation of the degree of educational effort required to become proficient in the use of the technique or tool, in man days effort.	-	P9
Acquisition Cost - The cost of acquiring or developing the technique or tool, if applicable.	-	P9
<u>Operation Costs</u> - An estimation of the cost, in whatever resources are required, involved in using the technique.	_	P9

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COLLEC- TION METHOD	Ψ	P10	P10	P10	P10	P10	P10	P10	P10
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	5. Programming Language Statistics. Information identifying the program language(s) used by project personnel with an evaluation of the relevance of the language to the problem, including:	a. Source Language Identifier - Identification of the source language used.	 Machine Language Identifier - Identification of the machine language used. 	c. <u>Language Reliability</u> - An evaluation of the degree of reliability in the use and operation of the special language compiler and/or assembler.	 d. <u>Language Documentation</u> - An evaluation of the accessability and under- standability of the documentation supporting the specified program language. 	e. <u>Language Relevance</u> - An evaluation of the relevance of the programming language to the software problem, with consideration to the develop-ment methodology used by the project.	f. Acquisition Costs - The total resources expended in the installation of the language, if applicable.	 g. Language Efficiency - An evaluation of the operational efficiency of the language within the operating milieu of the hardware/software support systems. 	h. <u>Training Costs</u> - The total resources expended in the training of project personnel in the use of the programming language.

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Project Performance Attributes. The category of data items that describe the work, plans, actual performance, and product description of the development project.	Work Data. Information concerning the work element, where work element is a project, phase, task, or activity. This includes the structure of the work element engaged in by project personnel, the scheduling of the work element in time, the utilization of resources for the work element, and the productivity or effectiveness of the above in relation to the work element.	 Work Definition. The identication of the work to be performed including: a. Work Identifier - A name or number uniquely identifying this particular work element. 	c. Work Description - A brief narrative description of the work to be performed including the purpose, scope and method for this element.	 d. Work Level - Indication of the work breakdown level. Choices are project, phase task, activity or job. 	 e. [Work] Structure - Identification of all of the components of the next level work element into which the total project is sub- divided. 	2. Schedule Statistics. Information specifying the expected and actual scheduling of a work element in elapsed and/or calendar time, including:	 a. <u>Duration</u> - The time units normally in terms of the number of work days, of the work element. (Calculated from inputs.) 	 Start Date - The calendar (or relative) data of starting the work element. 	c. Completion Date - The calendar (or relative) date of completing the work element.	 d. Schedule Variance - The amount by which an actual date preceeds, or follows, an estimated date for the work element. (Calculated from inputs.)

	DATA	COLLEC- TION METHOD
Terminator - The action being taken that completes the work element defined, e.g., a milestone an informal review, or a delivery.	-	E [3
Resource Utilization. Items that specify the expected and actual expenditure of resources in the performance of the work element including:		
Resource Identifier - A short name or number identifying the specific kind of resource to be utilized, e.g., personnel classification, machine type, travel type, etc.	-	WJ,
Resource Unit - The basic unit of expenditure of the resource, as manhours or mandays, machine hours or minutes.	-	3
Resource Expenditures - The amount of the resource allocation or budgeted for the work element.	-	5
Resource Expenditure To Date - The amount of the resource allo- cated for expenditure to the reporting date for the work element	-	(M. M.
Resource Variance - The amount by which an actual expenditure exceeds or falls below estimated (allocated) resource amounts. For incomplete tasks, computed on resources allocated and expended to date. (Calculated from inputs).		
Work/Product Identifigr(s) - The combination of the work identifier and product identifier used for tracking resource utilization.	-	M3

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	c. Product Cost - The value of the resources expended in the production of the product. (If more than one type of resource is expended, resource values should be reduced to a common base such as dollars. However, the productivity of individual resources may be evaluated, ignoring other costs.)	d. Productivity Index - The ratio of Product Value to Product Cost - i.e., the average number of production or Work Units produced per unit expenditure.	Product Data. Information pertaining to product characteristics including:	 a. Product Complexity - An estimate of the complexity level of the product leased on the number of product interfaces and/or processing decisions. 	b. Product Familiarity - An estimate of how well the configuration item or product and its characteristics are understood, based on the amount of research and development or analytic effort necessary to its complete definition.	c. Product Stability Rating - An evaluation of the amount of change ' encountered in producing the configuration item or product.	d. Language Identifier - Programming Language Identifier in which this product is written, if applicable.	e. Language Relevance - An evaluation of the relevance of the programming language to the software problem, with consideration to the development methodology used.	f. <u>Language Efficiency</u> - An evaluation of the operational efficiency of the language, considering the hardware/software support systems.

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Technique Identifier used in development.	fier - A short descriptive title of the techniques ent.	_	M2	
Relevance to Product bility of the techniq	Relevance to Product - An overall rating of the specific applicability of the technique to the application problem solved.	-	WZ	
Integration Ratir is integrated wit compiler might er	Integration Rating - A rating of the degree to which this technique is integrated with, or supports, other tools and techniques, as a compiler might enforce programming standards.	-	W2	
Product Status - current to the re	Product Status - The level of work accomplished for the product, current to the reporting cycle. Choices include:	_	M3	
Started - Work Continuing - Work Completed - Work Milestone - Indi	Work was initiated Work is continuing Work is completed Indication that the Milestone for this work/product element was successfully passed.			
k Units Produc	Work Units Produced - The number of work units produced during the reporting period for the specified product.	_	M3	
Units Discar	Work Units Discarded - The number of work units discarded during the reporting period for the specified product. (Calculated from inputs)	4 6		
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COLLEC- TION METHOD	A											
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Quality Assurance Attributes. Information defining the procedures for resolving deficiencies and/or modifications; and the project milestones that have been	established for evaluating work progress, performance, and completion of a milestone.	1. Modification Definition. Information describing all proposed modifications to the product due to discovered or developing deficiencies, including:	a. Modification Identifier - An alphanumeric designator uniquely identifying a proposed change or correction to a product. (Changes are normally requested via an Engineering Change Proposal (ECP) and identified by being sequentially numbered within the class [ECPXXX]. Corrections are normally identified by a Software Problem Report (SPR) or Discrepancy Report Form (DRF) and also sequentially numbered within the class.)	b. Modification Description - A brief narrative description of the proposed change or suspected deficiency with supporting evidence.	c. Impacted Products - A list of the Product Identifiers of those products that are affected by the proposed modification.	d. Employee Identifier - The name or number of the employee submitting the proposed modification.	e. Modification Date - Date the proposed modification is received by PMO.	f. <u>Modification Status</u> - A code indicating the current state of processing of the modification. Example choices include: Open, closed, pending.	 <u>Date of Problem Discovery</u> - Date the problem is discovered by the project employee, in the form yymmdd. 	h. <u>Time of Day</u> - Exact time of day on the above date that the problem was discovered, in the form hh:mm.	i. <u>Mork Identifier in Progress</u> - Identification of the work element in progress during which the problem was discovered. In the event that separate testing periods were not identified as activities on the WI - Work Definition Form, the following test periods are suggested:	U - Unit (or module) test

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GROUI	 I - Integration test S - System test A - Acceptance test 0 - Site or installation test 	 Products Used with Problem Occurred - Identifiers of other products being used which demonstrated the error, e.g., Data Base Identifier, Test Case Identifier, Test Tool Identifier. 	k. Employee Assigned - A name or number uniquely identifying the project member responsible for correction. (To be used by project office only.)					

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		Modification Transmittal - Information describing the nature of the modifications made to the product.	a. Change Identifier - An alphanumeric identifier uniquely identifying a change or package of changes to a product. (The identifier is normally composed of set of initials identifying the type of change package and a number indicating the sequential number of the change). Choices include:	- A Version Description Document accompanying a release of a system specifying which changes incorporated to which modeles of the system.	SCNXXX - A Specification Change Notice accompanying a package of change pages to a design specification, test plan or other document.	CRXXX - A Change Report covering a series of Class II (non-cost, non-impact) changes that have been made to the system.	b. <u>Date of Correction</u> - The calendar date the error was corrected, in the format yymmdd.	c. Time of Day of Correction - The time of day on the above date the error was corrected, in the format hh:mm.	d. Employee Identifier - The name or number of the employees responsible for modification. (To be used by project office only.)	e. <u>Modification Reports Resolved</u> - A list of the Modification Identifiers that this modification package resolves.	f. <u>Product Identifier</u> - The name(s) of the product items containing or impacted by the error. When the error is found to be in more than one product, list all products, e.g., documents, data base.	 Unit of Change - The unit used to measure the size of a change, as lines of code, or pages of documents. 	h. Amount Change - The volume and direction of change as a result of the modification, + = addition, - = deletion, / = change.
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Difficulty Rating - An evalution of the degree of difficulty in implementing the change. (The difficulty rating should be estimated with regard to the impact the error had on the specific product.)
Work Element in Progress - Name of the work element in progress for the specific product when the correction was made.
Software Termination - Indicate how the software terminated ng when the error occurred. - Normal processing termination - Abnormal processor termination
ment in Progress when Error Generated - Identify as near as the work element in progress in which the error was generated.
Resource Data - Indicate in days the amount of manpower needed to correct the error and install the software modifi-
- The exact amount of CPU time in minutes used to correct
Error Description - Description of the error, including the accuracy of the error description on the associated SPR(s).
Date Received - Date the project manager's office received the SMT, in the format yymmdd.
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Milestone Identifier - A unique alphabetic or numeric name designating 2 W8 a specific milestone event.
Work Identifier - Identification of the work element whose successful 2 W8 completion is to be evaluated. (This datum may be omitted if the milestone is not associated with a single work element.)
Event - The date, scheduled or actual, of the milestone event, 2 W8 format yymmdd.
Milestone Type - The general class of event taken as an index of project progress and product quality. Choices include: product review, product delivery, performance test, etc.
Milestone Status - Checks the current status of processing of a 2 W8 milestone event. Choices include:
Milestone event has been scheduled. Milestone event has been successfully completed. Milestone event has occurred and revisions, errors, or other modifications to product or work elements are required for successfull closure.
- A narrative description of the milestone event, 2 W8
Identification of the criteria for accept-
Work Identifier(s) - Specify the work element to be completed as a criteria for milestone acceptance. (These data may be omitted when the work element identified in Work Identifier applies to all products.)
Identifier - Specify the highest-level product identifier for 2 W8 element specified that is to be evaluated during the milestone

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Product Quality Measurement. A category of data items dealing with very fine measures of program structure, performance, and reliability.	Static Analysis Data Parameters. Information on the behavior and structure of software components without the execution of the software. Product, as referenced below, may include a module, subsystem, or system, or other project dependent hierarchical structure. All data items may not be applicable to all structures. The Static Analysis Data Parameters may include additional data as the tools or needs for that data become available.	1. Product Structural Characteristics. Items dealing with product structure, interfaces and physical statistics. (The following list is an example of the structural characteristics that could be obtained as the need for them is realized.	a. <u>Product Identifier</u> - A short name or number uniquely identifying the product.	b. Product Version Number - Current version number of product.	c. Product Modification Number - Current modification number of product.	d. Last Compilation Date - The date the product was last compiled, i.e., the mod date.	e. Source Language Identifier - The name or designator for the source language in which the product is written.	f. Next Level Product Identifier - The Product Identifier of which this product is part.	g. External Reference Indicator - A code indicating the product's of external data references (COMPOOL, COMMON)	h. Data Set - A list of the external data for which the product sets values	i. Data Used - A list of the external data used by the product.	j. External Data Count - A count of the external data references.	k. Internal Data Count - A count of the internal data elements.	1. Total Source Code - The number of lines of source code (eliminating comments) contained in product.
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consist developed the consequence of the first of the consequence of the first of the consequence of the con	THE THE STREET STREET STREET STREET THE SEC TO BE SECURED TO SECURE STREET STREET STREET STREET	Executable Statements - The number of statements resulting in one or more machine operations contained in product.	Non-executable Statements - The number of comments or other non-operation instructions contained in product.	. Total Machine Code - The number of machine instructions in the object code belonging to product.	. Number of Branches - A count of the branch instructions in the source code.	. Interface Count - The number of external references made by product.	. Reference Name - The tag of an external reference.	. Entry Points - A count of the entry points.	Exit Points - A count of the exits points.	. Computational Code - A count or percentage of total code classed as computational statements.	. Logical Code - A count or percentage of total code classed as logical statements.	. $1/0$ Code - A count or percentage of total code classed as $1/0$ statements.	Nesting - The number of levels of nested loops, conditionals, or recursions.	Language Structure Characteristics - Items providing information on the language constructs used, frequency of use, and associated other data, as	needed.
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Execution Analysis Data Parameters. Data collected on the operational behavior of software components during the execution of the software. Product, as referenced below, may include a module, subsystem, or system, or other project dependent hierarchical structure. The Execution halysis Data Parameters may include additional data as the tools or needs for that data become available. 1. [Product] Operational Behavior Characteristics. Items providing information that pore an example of run-time characteristics which may be obtained as the need for them is realized.) a. [Product] Identifier - A short name or number uniquely identifying the product. c. [Product] Identifier - A short name or number uniquely identifying the product.] d. Execution Ext. Case Identifier - A short name or number uniquely identifying the test Case Identifier - A short name or number uniquely identifying the test case Identifier - A short name identifying the variables used in the test case Identifier - A short name identifying the variables used in the test case Identifier - A short name identifying the variables used in the test run that are crucial to the success of the run, if applicable. 7. Execution Frequency - Percent of executable statements that were exercised by the test case. 9. Variable Identifier - A short name identifying the variables wariables that were exercised by the test case. 10. Number of Paths Executed - The number of logical paths exercised by the test case. 11. Number of Paths Executed - The number of decision points executed by test case. 12. Run-Time Statistics. Information on the computer operations and errors found during the checkout of a product.
alysis Data Parameters. Data collected on the operational behavior components during the execution of the software. Product, as elow, may include a module, subsystem, or system, or other project erarchical structure. The Execution Analysis Data Parameters may tional data as the tools or needs for that data become available. tional date as the tools or needs for that data become available. It operational behavior Characteristics. Items providing information that are an example of run-time characteristics as be obtained as the need for them is realized.) Iroduct] Identifier - A short name or number uniquely identifying the oduct. Wedification Number - op cit. Ecutable Statements - A short name or number uniquely identifying the stable ldentifier - A short name identifying the variables used in etast case. Iriable Identifier - A short name identifying the variables used in rables that were exercised by the test case. Iriables that were exercised by the test case. Interpretations Executed - The number of logical paths exercised by etest case. Estatistics. Information on the computer operations and errors uring the checkout of a product.
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		Product Structure Acquisition Statistics. Information identifying the product's interface structure as demonstrated automatically against the preestablished design of the product.	Project Programming Standards Statistics. Information on the programming and interface standards adhered to by project personnel in the development in the software, including:	a. Standards Identification - Identify project standards, including coding conventions.	b. Compliance to Standards - Data on the percentage of total software complying to established project standards.	Data structure Definitions and Usage Statistics. Information relating to the definition, structure and use of data elements in the software product, including:	a. Data Structure Definition Mechanism - Information on the structure and definition the data elements and/or arrays.	b. Data Structure Usage Accounting - Information on the usage of the data structures referenced by the software components.	Compile-Time Statistics. Information relating to the language constructs and errors made in using a specific language.	Reliability Modeling Data - Information supporting the requirements for mathematical modeling to predict failure rate, including:	a. Total Operational CPU Time - Cumulative time in hours, minutes, and seconds the software has operated.	b. Error Data - Categorization by type of all errors in the software type of all errors in the software and the times of their occurrence.
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MISSION of Rome Air Development Center

RADC plans and conducts research, exploratory and advanced development programs in command, control, and communications (C^3) activities, and in the C^3 areas of information sciences and intelligence. The principal technical mission areas are communications, electromagnetic guidance and control, surveillance of ground and aerospace objects, intelligence data collection and handling, information system technology, ionospheric propagation, solid state sciences, microwave physics and electronic reliability, maintainability and compatibility.

